NEW HOLLAND

TM115
TM125
TM135
TM150
TM165

OPERATOR'S MANUAL



86603890 3/00

NEW HOLLAND



CAUTION: THIS SYMBOL IS USED THROUGHOUT THIS BOOK WHENEVER PERSONAL SAFETY IS INVOLVED. TAKE TIME TO READ AND FOLLOW THE INSTRUCTIONS. BE CAREFUL!

CAUTION: PICTURES IN THIS MANUAL MAY SHOW PROTECTIVE SHIELDING OPEN OR REMOVED TO BETTER ILLUSTRATE A PARTICULAR FEATURE OR ADJUSTMENT.

BE CERTAIN, HOWEVER, TO CLOSE OR REPLACE ALL SHIELDING BEFORE OPERATING THE MACHINE.

IMPROVEMENTS

New Holland North America, Inc. is continually striving to improve its products. We reserve the right to make improvements or changes when it becomes practical and possible to do so, without incurring any obligation to make changes or additions to the equipment sold previously.

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CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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SECTION 1
GENERAL INFORMATION AND SAFETY

TO THE OWNER

GENERAL

This Manual has been prepared to assist you in the correct procedure for running-in, driving and operating and for the maintenance of your new tractor. Your tractor, which was designed to power and propel itself, is intended for use in normal and customary agricultural applications.

Read this Manual carefully and keep it in a convenient place for future reference. If at any time you require advice concerning your tractor, do not hesitate to contact your authorised dealer. He has factory trained personnel, genuine manufacturers' parts and the necessary equipment to carry out all your service requirements.

Your tractor has been designed and built to give maximum performance, economy and ease of operation under a wide variety of operating conditions. Prior to delivery, the tractor was carefully inspected, both at the factory and by your dealer to ensure that it reaches you in optimum condition. To maintain this condition and ensure trouble-free operation, it is important that the routine services, as specified in Section 4 of this Manual, are carried out at the recommended intervals.

CLEANING THE TRACTOR

Your tractor is a state-of-the-art machine with sophisticated, electronic controls. This should be borne in mind when cleaning the tractor, particularly if using a high pressure washer. Even though every precaution has been taken to safeguard electronic components and connections, the pressure generated by some of these machines is such that complete protection against water ingress cannot be guaranteed.

When using a high pressure washer, do not stand too close to the tractor and avoid directing the jet at electronic components, electrical connections, breathers, seals, filler caps, etc. Never direct a cold water jet at a hot engine or exhaust.

SAFETY

Pages 1-5 to 1-10 inclusive list the precautions to be observed to ensure your safety and the safety of others. Read the safety precautions and follow the advice offered **before** operating the tractor.

FIRST 50 HOUR SERVICE

In Section 9, at the back of this Manual, you will find the 50-hour service reports.

After you have operated the tractor for 50 hours, take your tractor, together with this Manual, to your dealer. He will then perform the factory recommended 50 hour service and complete the service report sheets (pages 9-1 and 9-3). The first sheet (page 9-1) is the dealer's copy and should be removed by the dealer after the service has been carried out. The second sheet (page 9-3) is your copy of the service performed. **Ensure that you and the dealer sign both copies.**

SERVICE PARTS

It should be pointed out that genuine parts have been examined and approved by the Company. The installation and/or use of 'non-genuine' products could have negative effects upon the design characteristics of your tractor and thereby affect it's safety. The Company is not liable for any damage caused by the use of 'non-genuine' parts and accessories. Only genuine New Holland replacement parts should be used. The use of non-genuine parts may invalidate legal approvals associated with this product.

It is prohibited to carry out any modifications to the tractor unless specifically authorised, in writing, by the After Sales Service department of the Company.

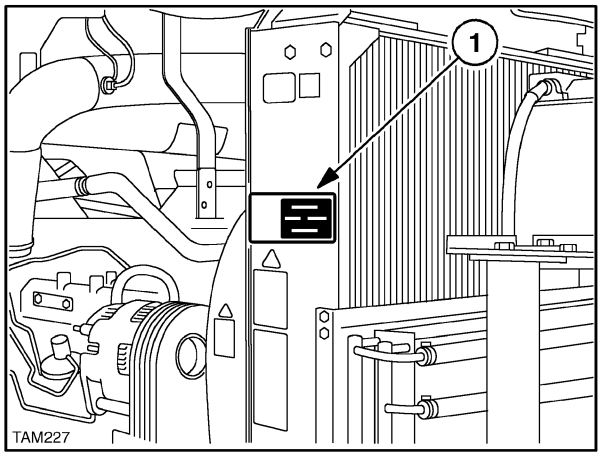
WARRANTY

Your tractor is warranted according to legal rights in your country and the contractual agreement with the selling dealer. No warranty shall, however, apply if the tractor has not been used, adjusted and maintained according to the instructions given in the Operator's Manual.

PRODUCT IDENTIFICATION

The tractor and major components are identified using serial numbers and/or manufacturing codes. Tractor identification data must be supplied to the dealer when requesting parts or service and will also be needed to aid in identifying the tractor if it is ever stolen.

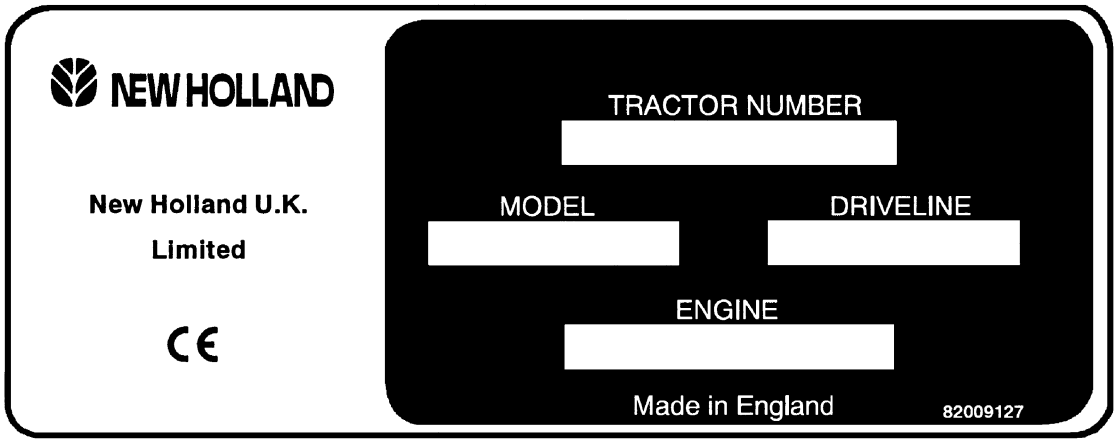
The following provides the locations of the identification data.



1

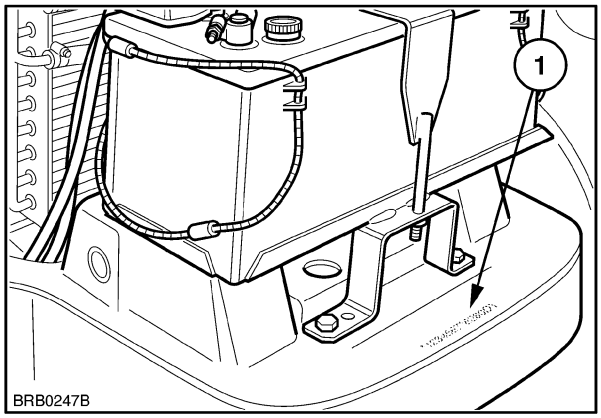
Vehicle Identification Plate - Figure 1

The vehicle identification plate, (1) Figure 1 is located on the right-hand radiator support. Record the information on the sample identification plate provided below.



Tractor Identification - Figure 2

The serial number and model identification information is stamped on the top of the front support (1). These numbers are also repeated on the vehicle identification plate reproduced above.

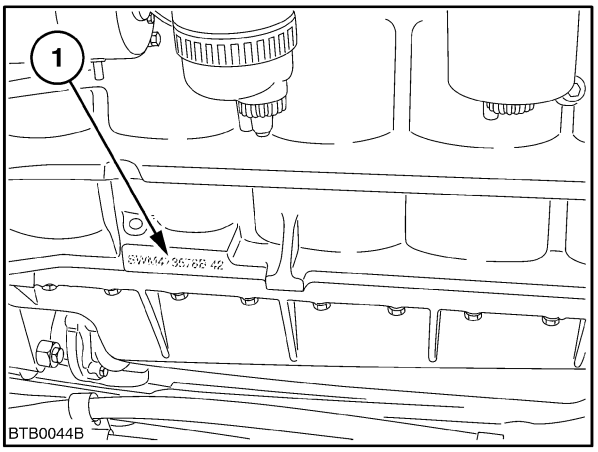


2

Engine Identification - Figure 3

The engine serial number and date code are stamped on a lug (1) Figure 3, protruding from the rear, right-hand side of the engine. This information is repeated on the emission control decal located on the engine valve cover, and on the vehicle identification plate reproduced on page 1-2.

Engine Serial No._____

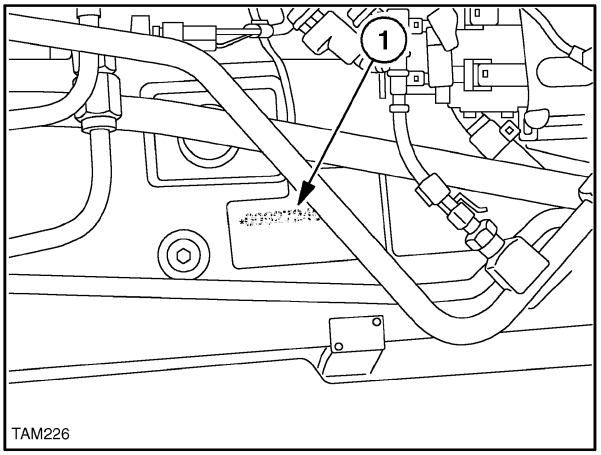


3

Driveline Identification - Figure 4

The serial number (1) is stamped on the right-hand side of the transmission housing. This information is repeated on the vehicle identification plate (Figure 1). Record the information below for quick reference.

Driveline Serial No._____

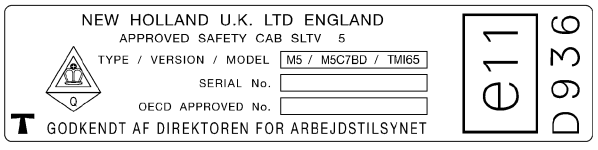


4

Cab Identification - Figure 5

The cab serial number and other information is on the OECD certification plate (1) on the inner surface of the left-hand crossrail, beneath the windscreen. Record the cab serial number below for quick reference.

Cab Serial No._____



5

ECOLOGY AND THE ENVIRONMENT

Soil, air and water are vital factors of agriculture and life in general. Where legislation does not yet rule the treatment of some of the substances which are required by advanced technology, common sense should govern the use and disposal of products of a chemical and petrochemical nature.

The following are recommendations which may be of assistance:

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.

- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti freeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances. Agricultural consultants will, in many cases, be able to help you as well.

HELPFUL HINTS

1. Avoid filling tanks using jerrycans or inappropriate pressurised fuel delivery systems which may cause considerable spillage.

2. In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which can be harmful to your health.

3. Modern oils contain additives. Do not burn contaminated fuels and/or waste oils in ordinary heating systems.

4. Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.

5. Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.

6. Do not open the air-conditioning system yourself. It contains gases which should not be released into the atmosphere. Your dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system anyway.

7. Repair any leaks or defects in the engine cooling or hydraulic system immediately.

8. Do not increase the pressure in a pressurised circuit as this may lead to the components exploding.

9. Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, causing the loss of oils, coolant, etc.

SAFETY PRECAUTIONS

A careful operator is the best operator. Most accidents can be avoided by observing certain precautions. To help prevent accidents, read and take the following precautions **before** driving, operating or servicing the tractor. Equipment should be operated only by those who are responsible and instructed to do so.

PRECAUTIONARY STATEMENTS

Throughout this Manual you will see text in *italics*, preceded by the words **NOTE, ATTENTION, IMPORTANT, CAUTION, WARNING** or **DANGER**. Such text has the following significance:

Machine Safety

NOTE: *This text stresses a correct operating technique or procedure.*

ATTENTION: *This text warns the operator of potential machine damage if a certain procedure is not followed.*

IMPORTANT: *This text informs the reader of something that he needs to know to prevent minor machine damage if a certain procedure is not followed.*

Personal Safety

CAUTION: *The word CAUTION is used where a safe behavioural practice, according to operating and maintenance instructions and common safety practices will protect the operator and others from accident involvement.*

WARNING: *The word WARNING denotes a potential or hidden hazard which could possibly cause serious injury. It is used to warn operators and others to exercise due care and attention to avoid a surprise accident with machinery.*

DANGER: *The word DANGER denotes a forbidden practice in connection with a serious hazard.*

Failure to follow the CAUTION, WARNING and DANGER instructions may result in serious bodily injury or even death.

THE TRACTOR

1. Read the Operator's Manual carefully before using the tractor. Lack of operating knowledge can lead to accidents.

2. Only allow properly trained and qualified persons to operate the tractor.

3. To prevent falls, use the handrails and step plates when getting on and off the tractor. Keep steps and platform clear of mud and debris.

4. Replace all missing, illegible or damaged safety decals.

5. Keep safety decals free of dirt or grime.



6. Do not permit anyone but the operator to ride on the tractor unless a passenger seat is fitted. There is no safe place for extra passengers otherwise.

7. Keep children away from the tractor and farm machinery at all times.

8. Do not modify or alter or permit anyone else to modify or alter the tractor or any of its components or any tractor function without first consulting your dealer.

9. Install all guards before starting the engine or operating the tractor.

DRIVING THE TRACTOR

1. Always sit in the driver's seat while starting or driving the tractor.

2. When driving on public roads, have consideration for other road users. Pull in to the side of the road occasionally to allow any following traffic to pass. Do

not exceed the legal speed limit set in your country for agricultural tractors.

3. Use a rotating beacon when driving on public roads to indicate that the vehicle is slow moving and is a possible hazard.

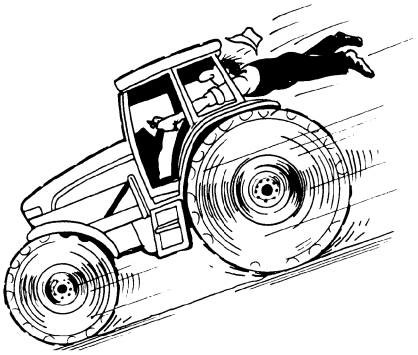
4. Dip the tractor lights when meeting a vehicle at night. Make sure the lights are adjusted to prevent blinding the driver of an oncoming vehicle.

5. Reduce speed before turning or applying the brakes. Brake both wheels simultaneously when making an emergency stop. Ensure that both brake pedals are locked together when travelling at road speeds or when on public roads to ensure correct operation of trailer brakes, balanced operation of the tractor brakes and four wheel braking (4WD tractors only).



6. On four wheel drive tractors, the drive to the front axle is automatically engaged, to provide four wheel braking, when both footbrakes are applied. Owners should be aware of the effectiveness of four wheel braking which greatly enhances braking performance. Appropriate care should be exercised during fierce braking.

7. Use extreme caution and avoid hard application of the tractor brakes when towing heavy loads at road speeds.



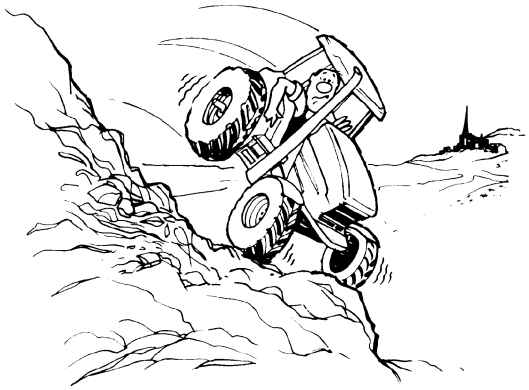
8. Keep the tractor in the same gear when going downhill as would be used when going uphill. Do not coast or freewheel down hills.

9. Any towed vehicle whose total weight exceeds that of the towing tractor must be equipped with brakes for safe operation.

10. Never apply the differential lock when turning. When engaged, the differential lock will prevent the tractor from turning.

11. Always check overhead clearance, especially when transporting the tractor. Watch where you are going, especially at row ends, on roads and around trees and low overhanging obstacles.

12. To avoid overturns, drive the tractor with care and at speeds compatible with safety, especially when operating over rough ground, when crossing ditches or slopes and when turning corners.



13. Use extreme caution when operating on steep slopes.

14. If the tractor becomes stuck or the tyres are frozen to the ground, reverse the tractor out to prevent overturning.

OPERATING THE TRACTOR

1. Apply the parking brake, place the P.T.O. control in the 'OFF' position, the lift control lever in the down position, the remote control valve levers in the neutral position and the transmission levers in neutral before starting the tractor.

2. Do not start the engine or operate controls (other than externally mounted hydraulic lift or P.T.O. switches, if fitted) while standing beside the tractor. Always sit in the tractor seat when starting the engine or operating the controls.

3. Do not bypass the transmission neutral start switches. Consult your authorised dealer if your neutral start controls malfunction. Use jump leads only in the recommended manner. Improper use can result in a tractor runaway.

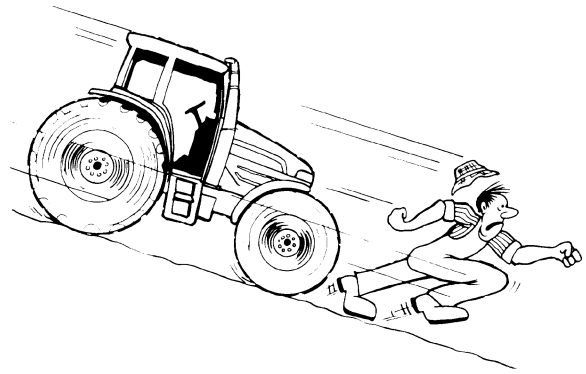


4. Avoid accidental contact with the gear shift levers while the engine is running. Unexpected tractor movement can result from such contact.

5. Do not get off the tractor while it is in motion.

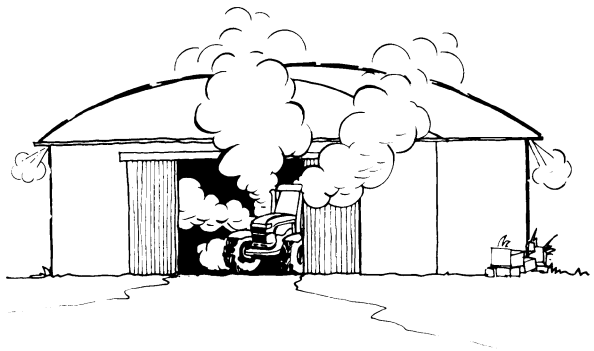
6. If the power steering or engine ceases operating, stop the tractor immediately as the tractor will be more difficult to control.

7. Before leaving the tractor, park the tractor on level ground, apply the parking brake, lower attached implements to the ground, disengage the P.T.O. and stop the engine.



8. Do not park the tractor on a steep incline.

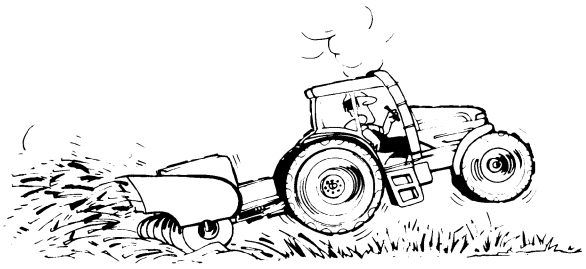
9. The cab is designed to provide the minimum noise level at the operator's ears and meets or exceeds applicable standards in this respect. However, noise (sound pressure level) in the workplace can exceed 85 dB(A) when working between buildings or in confined spaces, with cab windows open. Therefore, it is recommended that operators wear suitable ear protectors when operating in high noise level conditions.



10. Do not run the tractor engine in an enclosed building without adequate ventilation. Exhaust fumes are toxic and can cause death.

11. Pull only from the pick-up hitch, swinging drawbar or the lower link drawbar in the lowered position. Use only a drawbar pin that locks in place. Pulling from the tractor rear axle or any point above the axle may cause the tractor to overturn.

12. Always select Position Control when attaching equipment and when transporting equipment. Be sure hydraulic couplers are properly mounted and will disconnect safely in case of accidental detachment of the implement.



13. If the front end of the tractor tends to rise when heavy implements are attached to the three-point hitch, install front end or front wheel weights. Do not operate the tractor with a light front end.

14. Engage the clutch slowly when driving out of a ditch, gully or up a steep hillside. Disengage the clutch promptly if the front wheels rise off the ground.

15. Ensure any attached equipment or accessories are correctly installed, are approved for use with the tractor, do not overload the tractor and are operated and maintained in accordance with the instructions issued by the equipment or accessory manufacturer.

16. Remember that your tractor, if abused or incorrectly used, can be dangerous and become a hazard both to the operator and to bystanders. Do not overload or operate with attached equipment which is unsafe, not designed for the particular task or is poorly maintained.

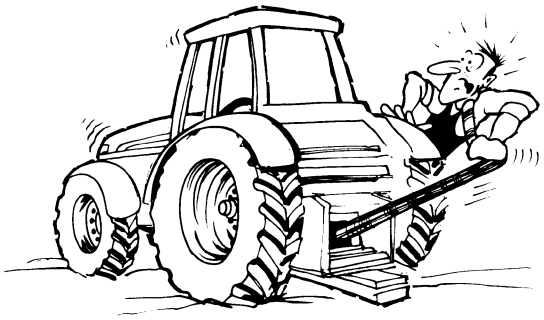
17. Do not leave equipment in the raised position when the vehicle is stopped or unattended.

18. Do not drive equipment near open fires.

19. Always wear a protective mask when working with toxic spray chemicals. Follow the directions on the chemical container.

OPERATING THE P.T.O.

1. When operating P.T.O.- driven equipment, shut off the engine, switch off the P.T.O. and wait until the P.T.O. stops before getting off the tractor and disconnecting the equipment.



2. Do not wear loose clothing when operating the power take-off or especially when near rotating equipment.

3. When operating stationary P.T.O.-driven equipment, always apply the tractor parking brake and block the rear wheels front and back.



4. To avoid injury, do not clean, adjust, unclog or service P.T.O. driven equipment when the tractor engine is running. Ensure that the P.T.O. is switched off.

5. Make sure the P.T.O. guard is in position at all times and always replace the P.T.O. cap when the P.T.O. is not in use.

SERVICING THE TRACTOR



1. The cooling system operates under pressure which is controlled by the expansion tank cap. It is dangerous to remove the cap while the system is hot. Always turn the cap slowly to the first stop and allow the pressure to escape before removing the cap entirely. Never remove the cap from the top of the radiator unless the expansion tank pressure cap has first been removed.

2. Do not smoke while refuelling the tractor. Keep any type of open flame away.

3. Keep the tractor and equipment, particularly brakes and steering, maintained in a reliable and satisfactory condition to ensure your safety and comply with legal requirements.

4. To prevent fire or explosion, keep open flames away from battery or cold weather starting aids. To prevent sparks which could cause explosion, use jumper cables according to instructions.

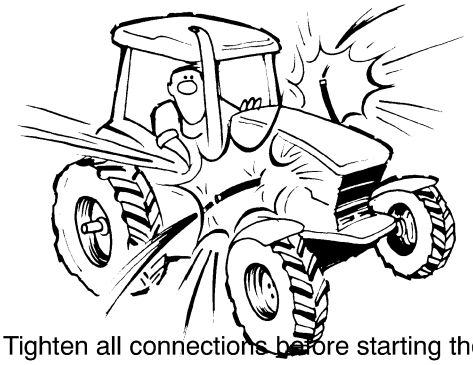
5. Do not attempt to service the air conditioning system. It is possible to be severely frost bitten or injured by escaping refrigerant. Special equipment and instruments are required to service the air conditioning system. See your authorised dealer for service.

6. Stop the engine before performing any service on the tractor.

7. Hydraulic fluid and fuel oil in the injection system operate under high pressure. Escaping hydraulic fluid or fuel oil under pressure can penetrate the skin causing serious injury. Unqualified persons should not remove or attempt to adjust a pump, injector, nozzle or any other part of the fuel injection or hydraulic systems. Failure to follow these instructions can result in serious injury.

- Do **not** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.

- Stop the engine and relieve pressure before connecting or disconnecting lines.



- Tighten all connections before starting the engine or pressurising lines.

- If fluid is injected into the skin obtain medical attention immediately or gangrene may result.

8. Do not modify or alter or permit anyone else to modify or alter the tractor or any of its components or any tractor function without first consulting an authorised dealer.

9. Continuous long term contact with used engine oil may cause skin cancer. Avoid prolonged contact with used engine oil. Wash skin promptly with soap and water.

10. Keep equipment clean and properly maintained.

11. Dispose of all drained fluids and removed filters properly.

12. Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot topple and cause injury.

DIESEL FUEL

1. Under no circumstances should gasoline, alcohol or blended fuels be added to diesel fuel. These combinations can create an increased fire or explosive hazard. In a closed container such as a fuel tank these blends are more explosive than pure gasoline. Do not use these blends.

2. Never remove the fuel cap or refuel with the engine running or hot.



3. Do not smoke while refuelling the tractor or when standing near fuel. Keep any type of open flame away.

4. Maintain control of the fuel filler pipe nozzle when filling the tank.

5. Do not fill the fuel tank to capacity. Fill only to the bottom of the filler neck to allow room for expansion.

6. Wipe up spilled fuel immediately.

7. Always tighten the fuel tank cap securely.

8. If the original fuel tank cap is lost, replace it with an approved cap. A non-approved cap may not be safe.

9. Never use fuel for cleaning purposes.

10. Arrange fuel purchases so that summer grade fuels are not held over and used in the winter.

SAFETY CAB

Your tractor is equipped with a safety cab which must be maintained in a serviceable condition. Be careful when driving through doorways or working in confined spaces with low headroom.

1. Do not modify, drill, weld or alter the safety cab in any way. Doing so could render you liable to legal prosecution in some countries.

2. Never attempt to straighten or weld any part of the main frame or retaining brackets which have suffered damage. By doing so you may weaken the structure and endanger your safety.

3. Do not secure any parts on the main frame or attach your safety cab with other than the special high tensile bolts and nuts specified.

4. Never attach chains or ropes to the cab or main frame for pulling purposes.

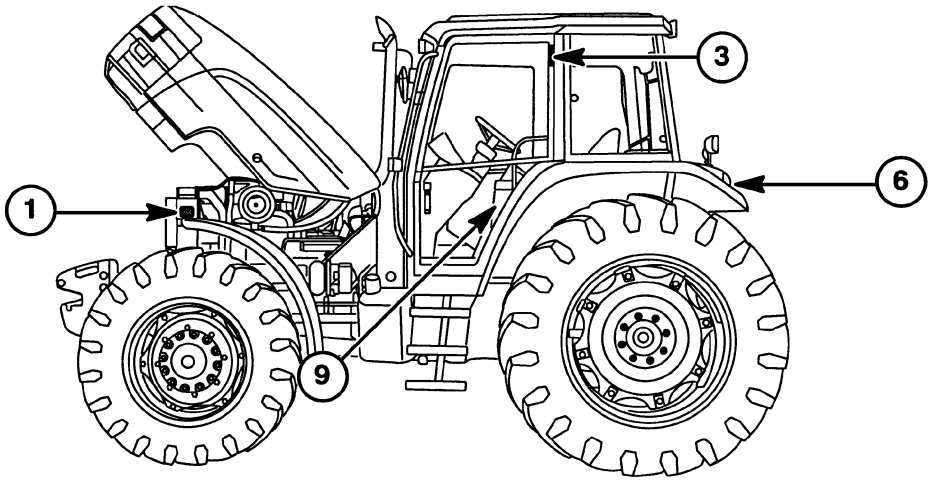
5. Never take unnecessary risks even though your safety cab affords you the maximum protection possible.

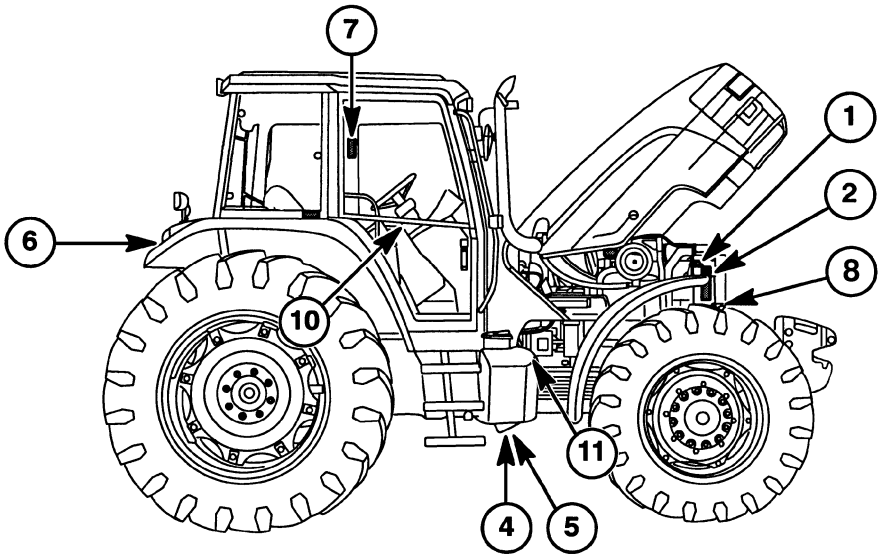
Whenever you see this symbol ⚠ it means: ATTENTION!

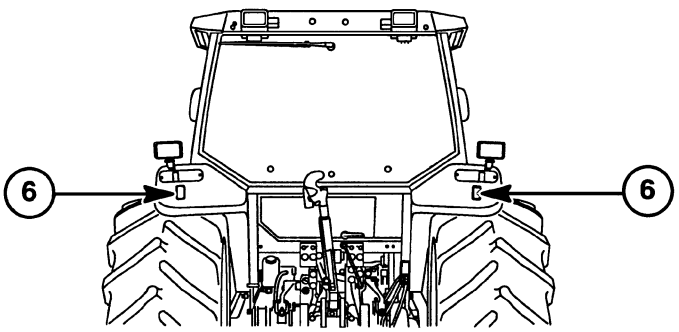
BECOME ALERT! YOUR SAFETY IS INVOLVED!

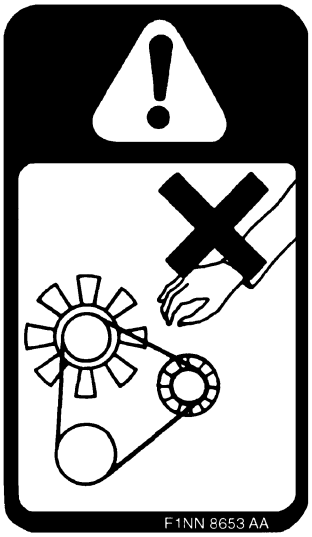
SAFETY DECALS

The decals reproduced on the following pages were installed on your tractor in the positions indicated in the drawings below. They are intended for your safety and for those working with you. Please take this Manual and walk around your tractor, noting the location of the decals and their significance. Review the decals and operating instructions detailed in this Manual with the machine operators. Keep the decals clean and legible. If they become damaged or illegible, obtain replacements from your authorised dealer.



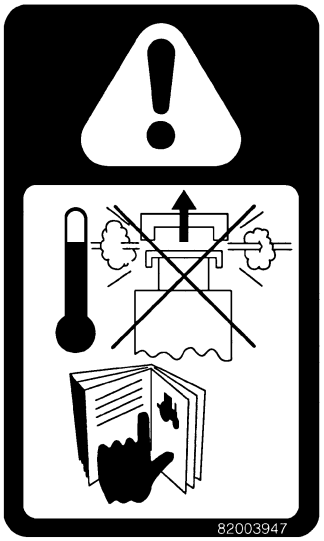






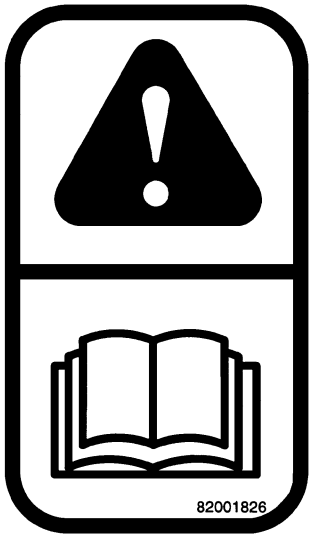
1. Location: Left- and right-hand side of radiator

To prevent serious injury, keep hands and clothing away from rotating fan and drive belt.



2. Location: Right-hand side of radiator and coolant overflow bottle

Warning! Pressurised cooling system. Allow to cool then remove cap carefully. Using a cloth, turn cap to the first stop and allow pressure to subside before removing cap completely.



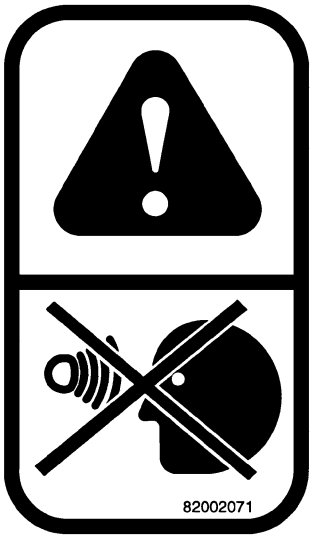
3. Location: Right-hand 'B' pillar, inside cab

General warning. Read and understand all the warning notes printed in this Operator's Manual. In particular, see pages 1-5 to 1-10 inclusive.



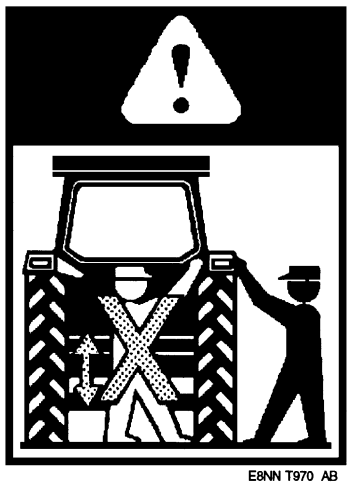
4. Location: Radar sensor mounting bracket (North America only.)

To avoid possible eye damage from micro-wave signals emitted by the radar sensor, do not look directly into the sensor face.



5. Location: Radar sensor mounting bracket (all countries except North America)

To avoid possible eye damage from micro-wave signals emitted by the radar sensor, do not look directly into the sensor face.



6. Location: Rear of both fenders (with external power lift controls only)

To avoid injury, do not stand on the implement or between the implement and tractor while operating the external lift controls.



7. Location: Left-hand 'B' pillar inside the cab

In an overturn, hold on tightly to the steering wheel. Do not attempt to jump out.



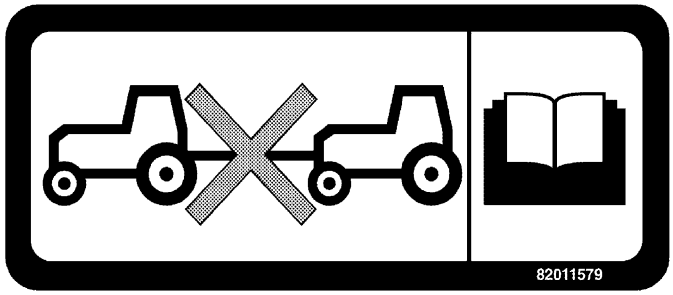
9. Location: Right-hand console (North America only)

External lift controls warning and instruction.



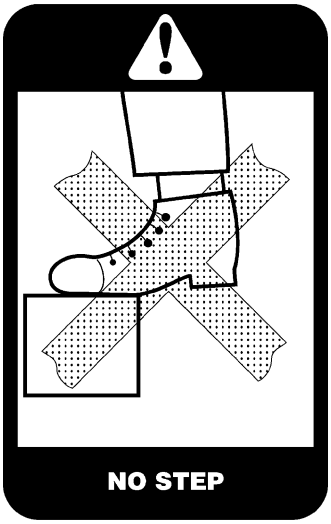
8. Location: Top of battery

Danger! Corrosive acid. Explosive gas. Wear eye protection. Avoid producing sparks. See Operator's Manual.



10. Location: Below instrument panel

Caution! Read Operator's Manual. before attempting to tow.



BRB0196A

11. Location: Right-hand fuel tank

Do not stand on fuel tank

INTERNATIONAL SYMBOLS

As a guide to the operation of your tractor, various universal symbols have been utilised on the instruments, controls, switches, and fuse box. The symbols are shown below with an indication of their meaning.


Thermostart starting aid


Alternator charge


Fuel level


Automatic Fuel shut-off


Engine speed (rev/min x 100)


Hours recorded


Engine oil pressure


Engine coolant temperature


Coolant level


Tractor lights


Headlamp main beam


Headlamp dipped beam


Work lamps


Stop lamps


Horn

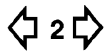

Radio

KAM
Keep alive memory


Turn signals



Turn signals –one trailer



Turn signals –two trailers


Front wind-screen wash/wipe


Rear wind-screen wash/wipe


Heater temp-erature control


Heater fan


Air conditioner


Air filter blocked


Parking brake


Brake fluid level


Trailer brake


Roof beacon


Warning! Corrosive substance


P.T.O.

N
Transmission in neutral


Creeper gears


Slow or low setting


Fast or high setting


Ground speed


Differential lock


Rear axle oil tem-perature


Transmission oil pressure


FWD engaged


FWD dis-engaged

Warning!

Hazard warning lights

Variable control

Pressurised! Open carefully

Position Control

Draft Control

Accessory socket

Implement socket

%age slip

Hitch raise (rear)

Hitch lower (rear)

Hitch height limit (rear)

Hitch height limit (front)

Hitch dis-abled

Hydraulic and transmission filters

Remote valve extend

Remote valve retract

Remote valve float

Malfunction! See Operator's Manual

Malfunction! (alter-native symbol)

AIRBORNE NOISE EMISSION

In accordance with E.E.C. directives, the noise levels of tractors covered by this Manual are as follows:

		Noise level at operator's ear*				Drive by noise	
Model		**Closed - dB(A)**		**Open - dB(A)**		**level - dB(A)**	
	Transmission	**Annex I***	**Annex II****	**Annex I****	**Annex II****	**30 kph**	**40kph**
TM115	Synchro or Dual Command	76	76	85	82	85	84
TM115	Range Command	78	74	87	82	83	83
TM125	Synchro or Dual Command	76	76	83	80	83	83
TM125	Range Command	76	75	84	81	82	82
TM135	Dual Command	75	75	83	80	84	83
TM135	Range Command	78	73	88	82	82	82
TM150	Range Command	76	73	87	81	84	83
TM150	Power Command	76	73	86	81	82	81
TM165	Range Command	78	74	87	81	84	83
TM165	Power Command	76	74	88	81	83	83

***Test results are in accordance with directive 77/311/EEC Annex I.
The noise level at the operator's ear is with cab side and rear windows and roof hatch open or closed, as indicated.

****Test results are in accordance with directive 77/311/EEC Annex II.
Maximum noise level at operator's ear with cab windows, roof hatch and doors closed, tractor off load.

NOTES

SECTION 2
CONTROLS, INSTRUMENTS AND OPERATION

BEFORE OPERATING

⚠ CAUTION ⚠

Before driving or operating the tractor, study the safety precautions in Section 1 of this Manual.

Read this section thoroughly. It details the location and operation of the various instruments, switches and controls on your tractor. Even if you operate other tractors, you should thoroughly read this section of the manual and ensure that you are familiar with the location and function of all the features of the tractor.

Do not start the engine or attempt to drive or operate the tractor until you are fully accustomed with all the controls. It is too late to learn once the tractor is moving. If in doubt about any aspect of operation of the tractor, consult your authorised dealer.

Pay particular attention to the recommendations for running-in to ensure that your tractor will give the long and dependable service for which it was designed. See page 3-7.

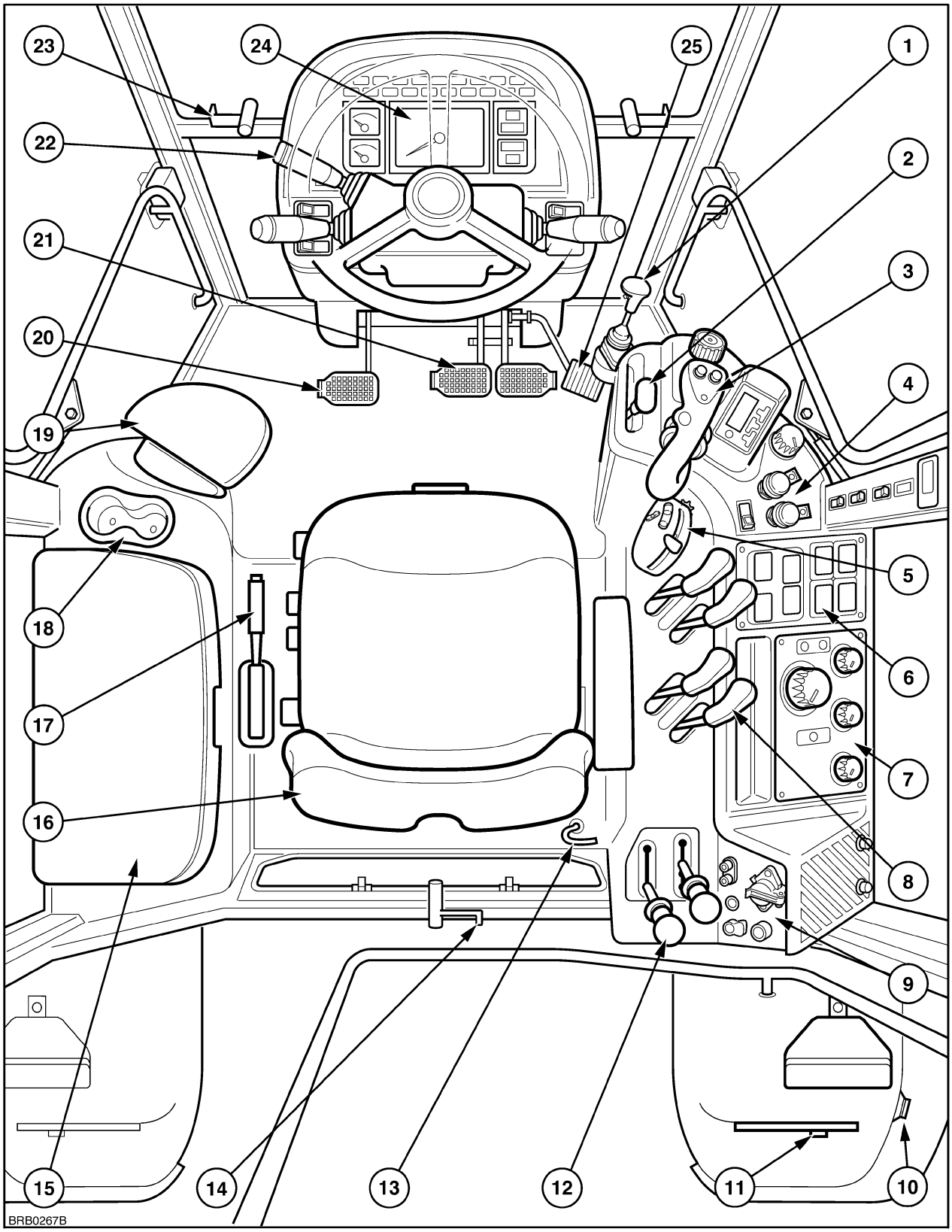
This section is split into 11 subjects, as follows. Where a feature requires setting up and running adjustments in the field, detailed instructions will be found in Section 3 - Field Operation. Instructions for the operation of various optional accessories will be found in Section 7.

Lubrication and maintenance requirements will be found in Section 4. Tractor specifications are listed in Section 8.

A comprehensive index is provided at the end of this book.

Subject	Page
Cab	2-2
Seats	2-17
Handbrake, Throttle and Foot Controls	2-23
Instrument Console	2-25
Analogue and Analogue/Digital Instruments	2-28
Electronic Instrument Panel	2-34
Synchro Command Transmission (16 x 16 and 20 x 16)	2-54
Dual Command Transmission (24 x 12 and 23 x 12)	2-61
Range Command Transmission (18 x 6 and 17 x 6)	2-70
Power Command Transmission (18 x 6 and 17 x 6)	2-85
Electronic Management Unit	2-100

CAB AND PLATFORM CONTROLS



1 General View of Tractor Controls

Key to Figure 1 **Page Nos. for Reference**

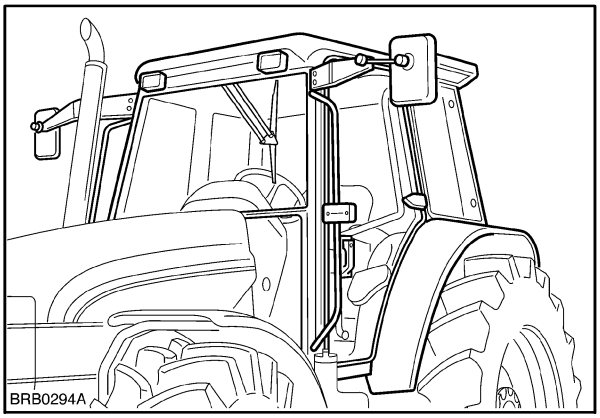
1. Joystick control 3-26/3-31, 3-59
2. Hand throttle 2-23
3. Transmission controls
   - Synchro Command transmission 2-54/2-56
   - Dual Command transmission 2-61/2-65
   - Range Command transmission 2-70/2-78
   - Power Command transmission 2-85/2-99
4. P.T.O. controls and front hitch 3-9/3-31
5. Hydraulics controls
   - Open centre system 3-32/3-37
   - Closed centre system 3-51/3-57
6. Electronic Management Unit (EMU) 2-100/2-106
7. E.D.C. control panel 3-51/3-57
8. Remote control valve levers
   - Open centre system 3-38/3-44
   - Closed centre system 3-58/3-58
9. Electrical accessory sockets 2-14
10. External P.T.O. control switch 3-22
11. External hydraulic power lift control 3-55/3-57
12. P.T.O. range selectors 3-9/3-24
13. Release handle
    - Automatic pick-up hitch 7-25
    - Tow hitch 7-24
14. Rear window locking handle 2-6
15. Storage box 2-12
16. Operator's seat 2-17/2-20
17. Parking brake 2-23
18. Drinks holder 2-12
19. Folding passenger seat 2-12
20. Clutch/inching pedal
    - Synchro Command transmission 2-54/2-56
    - Dual Command transmission 2-61/2-65
    - Range Command transmission 2-70/2-78
    - Power Command transmission 2-85/2-99
21. Foot brakes 2-24
22. Shuttle lever
    - Dual Command transmission 2-61/2-65
    - Range Command transmission 2-70/2-78
    - Power Command transmission 2-85/2-99
23. Opening windscreen locking handle 2-6
24. Instrument panel
    - Console switches 2-25/2-27, 7-2
    - Analogue and analogue/digital instrument panel 2-28/2-33
    - Electronic instrument panel 2-34/2-53
25. Foot throttle 2-23

General - Figure 2

The cab has been designed for your comfort and convenience.

Two wide opening doors permit entry to the cab from either side, aided by convenient grab handles and footsteps with anti-slip treads

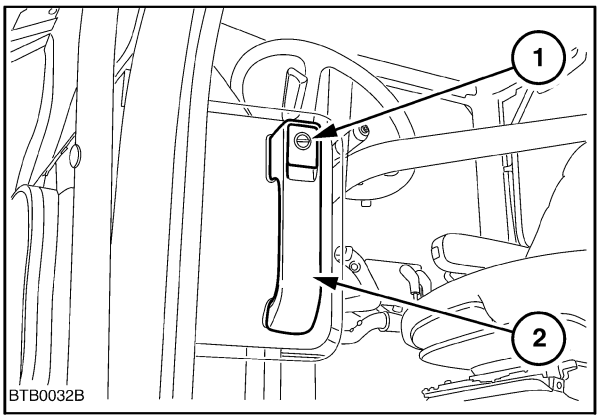
Standard cab features include a combined fresh air/recirculation heater/defroster, air-conditioning, sun visor, tinted glass and opening side windows. Options include cab suspension, opening roof hatch, radio/cassette player, rear windscreen washer/wiper, opening front windscreen and telescopic, exterior, rear view mirrors



2

External Door Handle - Figure 3

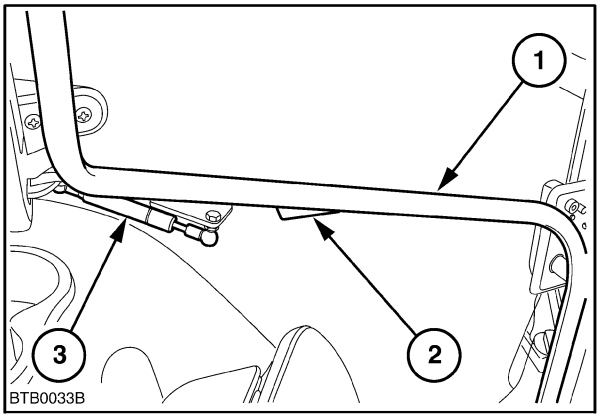
Each door is equipped with a lockable external handle (2) which may be locked from the outside using the key provided. Insert the key in the slot in the push button (1) and rotate the key to lock or unlock the door.



3

Interior Door Handle - Figure 4

To open a door from inside the cab, squeeze up the trigger (2) on the underside of the grab handle (1). Use the grab handle to push the door open.



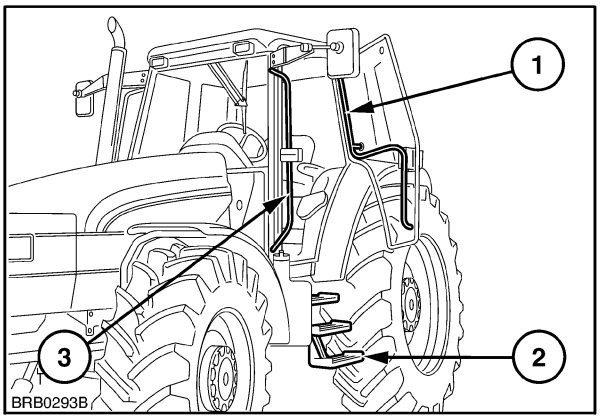
4

Entering and Exiting the Cab – Figure 5

The cab may be entered from the right or left side.

⚠ CAUTION ⚠

When entering the cab from the right-hand side, use only the grab handles to assist in climbing the steps. If the gear levers are grasped inadvertently, a tractor runaway may result.



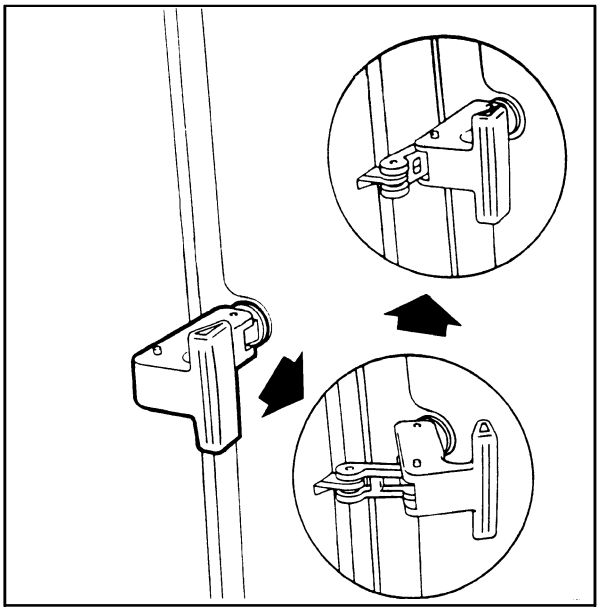
5

To enter the cab, face the door, then open it. Place one foot on the lowest step plate (2) and, using the grab handles (1) and (3) on the 'A' post and inside the door, climb the steps and enter the cab. Close the door, sit in the seat and fasten the seat belt, if fitted.

To exit the cab, release the seat belt, open the door, grasp the grab handles, back out of the cab and descend the steps using the grab handles.

Side Windows – Figure 6

The windows are hinged at the rear and can be locked in the closed position or retained in the partially open or fully open positions by an over-centre mechanism.

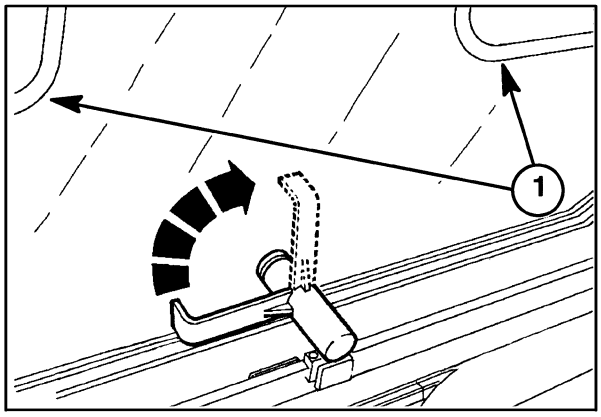


6

Rear Window – Figure 7

The rear window may be locked in the closed position or retained in the partially open or fully open positions.

To close the window, use the grab handles (1).



7

IMPORTANT: *Retain control of the window when opening it fully. Do not allow it to swing open freely.*

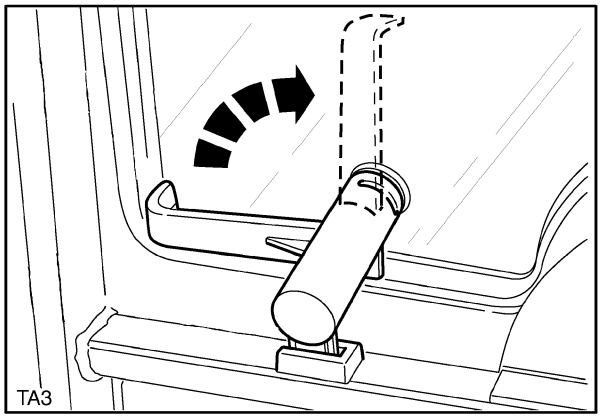
To close the window, use the grab handles (1). Push the locking handle down to lock the window.

Opening Front Windscreen (where fitted) – Figure 8

The front windscreen may also be locked in the closed position or retained in the partially open or fully open position in a similar manner to the rear window.

IMPORTANT: *Retain control of the windscreen when opening it fully. Do not allow it to swing open freely.*

To close the windscreen, pull on both handles equally. Push the locking handles down to lock in position.



8

Roof Hatch (where fitted) - Figure 9

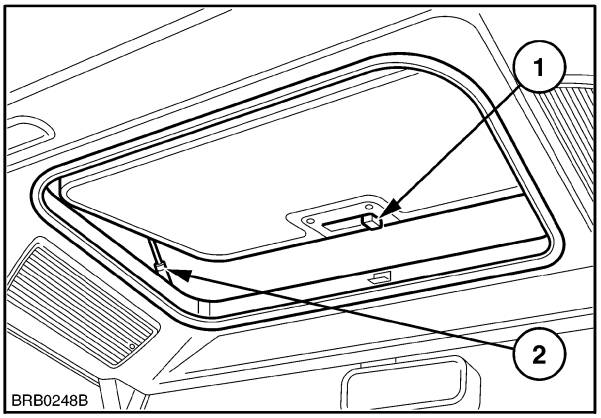
As well as providing increased ventilation in warm weather, the hatch provides an alternative means of leaving the cab in an emergency and is a legal requirement in some countries.

To open the hatch, push the release button (1), forward. Two gas struts (2) will retain the roof in the partially open position, as shown, to provide increased ventilation.

The strut has a quick-disconnect feature. To fully open the hatch, push firmly upwards. The struts will readily disconnect from the upper pins and permit the hatch to be fully opened.

⚠ CAUTION ⚠

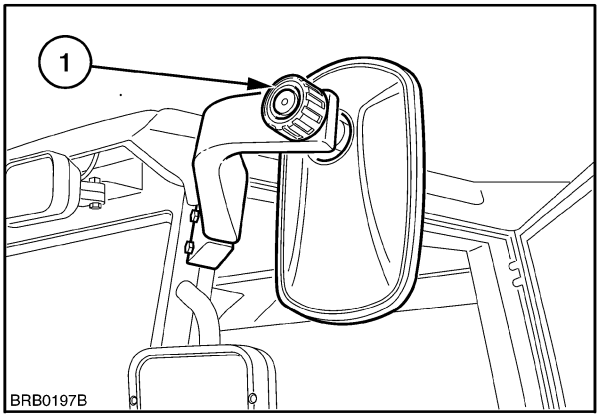
Practise opening the hatch so that you are familiar with the quick-disconnect feature. The escape hatch must be kept open when travelling over frozen water.



9

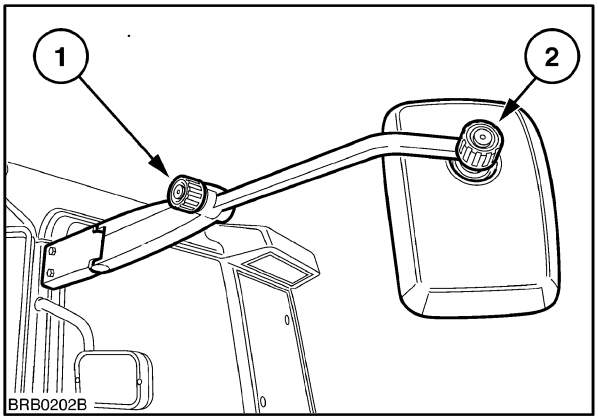
External Mirrors - Figures 10 and 11

A standard mirror is shown in Figure 10. Move the mirror arm, as required, to obtain the best rearward view. To adjust the angle of the mirror head, loosen the knob (1). Tighten the knob when the mirror is at the correct angle.



10

The optional, telescopic mirror is shown in Figure 11. Move the mirror arm, as required, to obtain the best rearward view. When the knob (1) is loosened, the telescopic arm may be extended, as shown. The telescopic feature is beneficial when towing extra wide trailers or equipment. To adjust the angle of the mirror head, loosen the knob (2). Tighten the knobs when the mirror is correctly positioned.



11

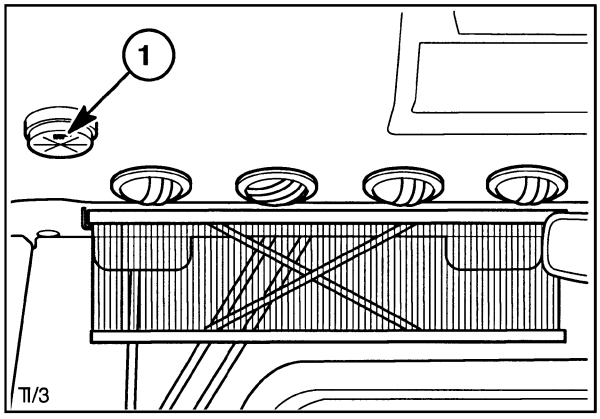
ROOF-MOUNTED CONTROLS

Interior Light - Figure 12

The interior light (1) has a built-in, 3-position switch.

Move the switch to the left to switch on the lamp. When the switch is moved to the right the lamp will illuminate automatically when either of the doors are opened.

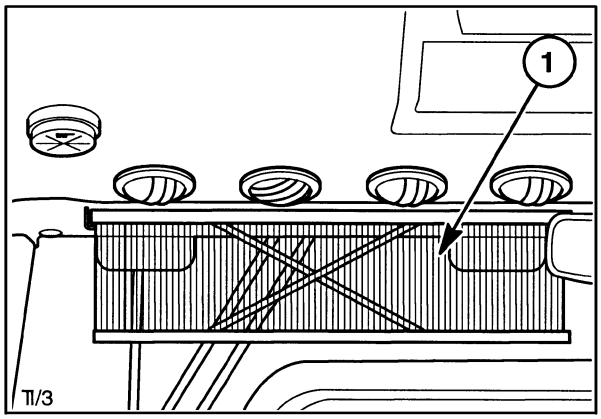
When the switch is in the central position, the light is off, irrespective of the position of the doors.



12

Sun Visor - Figure 13

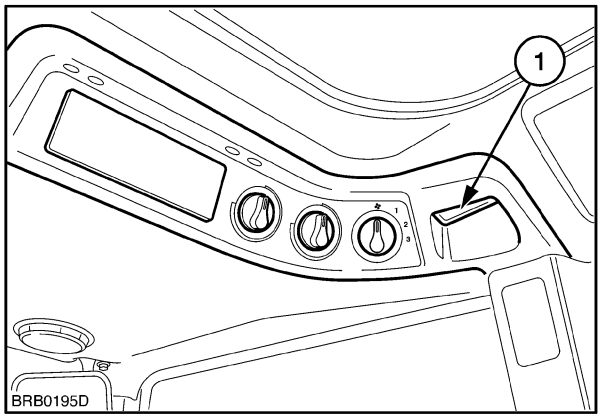
Pull down the sun visor (1) to protect the driver's eyes from the glare of the sun. The visor will remain in the chosen position. Push the visor up to retract.



13

Console Light - Figure 14

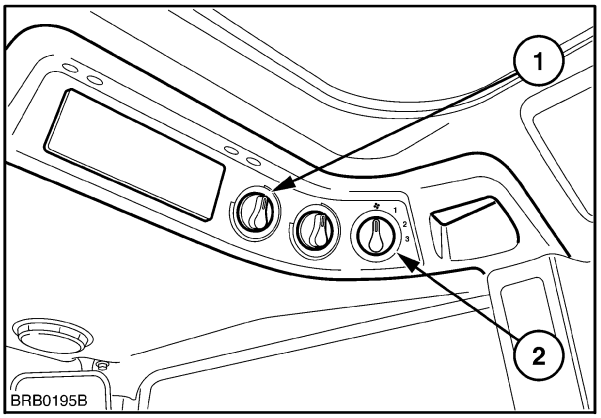
An overhead light (1) provides a soft, red glow to the gear levers and hydraulic console. The light is illuminated when the key-start switch turned on.



14

Heater Temperature Control - Figure 15

Turn the knob (1) clockwise to increase the temperature of the air from the heater. Turn fully anti-clockwise to obtain unheated air from the air vents in the roof.



15

Blower Control - Figure 15

A 3-speed blower is installed for the heater. Turn the switch (2) clockwise to the first position for low speed. Further rotation of the switch in a clockwise direction selects the medium and fast speeds.

The cab ventilation system has four filters, two to filter fresh air drawn into the cab from outside and two to filter recirculated air.

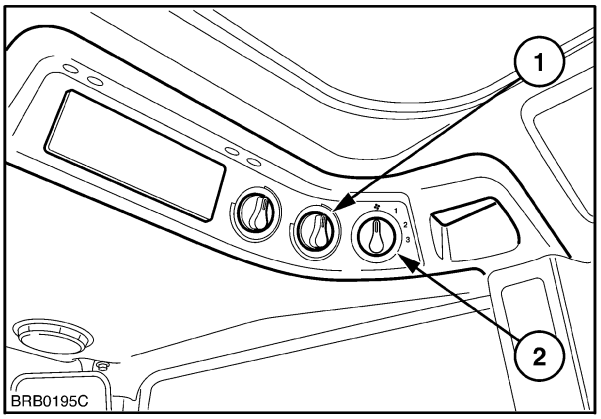
⚠ CAUTION ⚠

The cab air filters are designed to remove dust from the air but will not exclude chemical vapour. Follow the chemical manufacturer's directions regarding protection from dangerous chemicals.

Air Conditioner Temperature Control (where fitted) - Figure 16

Rotate the knob (1), clockwise, to activate the air conditioner compressor and lower the temperature of the air within the cab. The air conditioner will only operate with the blower (2) switched on.

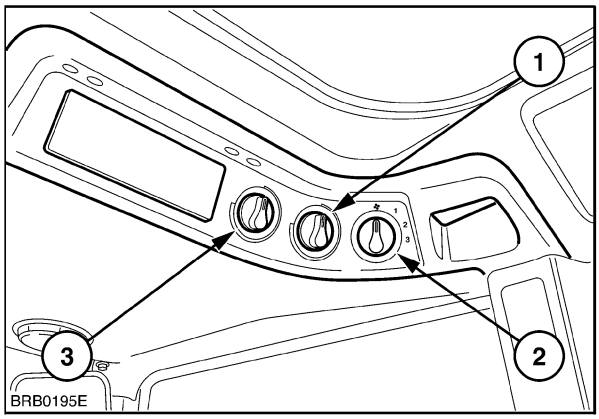
To quickly reduce in cab temerature operate the air conditioner at its lowest setting with the blower speed set to maximum. When the air has cooled sufficiently, adjust air conditioner and blower controls to maintain the desired temperature. Windows, doors and escape hatch should remain closed.



16

Figure 17

Under certain conditions, it may be desirable to operate both the air conditioner and heater together, e.g. to demist the windscreen and windows. (The air conditioner, as well as cooling, also removes moisture from the air). Run the engine to normal operating temperature, turn the heater temperature control (3) and blower control (2) to the maximum settings (fully clockwise). Adjust the swivelling air vents to direct the air flow, as required. See Figure 19.



17

When the windows are clear, adjust the heater control (3) and air conditioner temperature control (1) (or turn the air conditioner off) to maintain the desired cab air temperature.

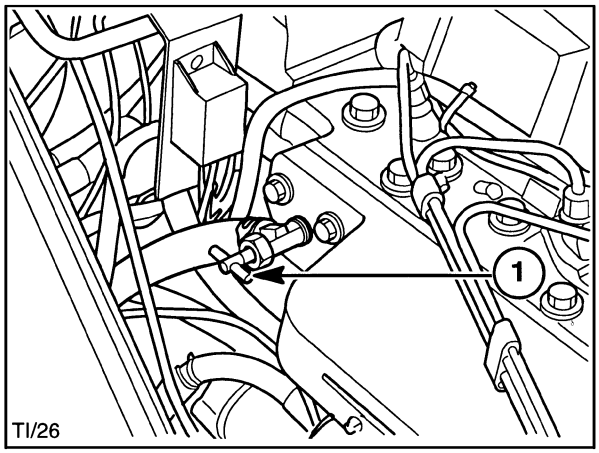
IMPORTANT: *Turn the air conditioner off when cooled or de-humified air is not required. For proper operation of the air conditioner, ensure that the cab air filters are serviced regularly. See section 4.*

IMPORTANT: *Run the engine at idle speed for at least 3 minutes after switching on the air conditioner, if the air conditioner has been out of use for more than 30 days.*

IMPORTANT: *The air conditioning system uses R134A refrigerant. Do* ***not*** *mix with other refrigerants.*

NOTE: *It is the normal function of the air conditioner to extract water from the air. Drain hoses lead from the air conditioner unit to a point beneath the cab. Do not be concerned if a pool of water collects beneath the drain hose outlets when the engine is stopped.*

IMPORTANT: *During the cold season, operate the air conditioning occasionally to ensure adequate lubrication of the system. Safety cut outs prevent operation of the air conditioner when the ambient temperature falls below a preset level.*



18

Heater Shut-off Valve - Figure 18

NOTE: *During the warm season, when the heater is no longer required, it is recommended that you close the heater shut-off valve (1) at the rear right-hand side of the engine.*

WARNING

The refrigerant used in the air conditioner system has a boiling point of -26° C (-15° F).

Never expose any part of the air conditioner system to a direct flame or excessive heat because of the risk of fire or explosion.

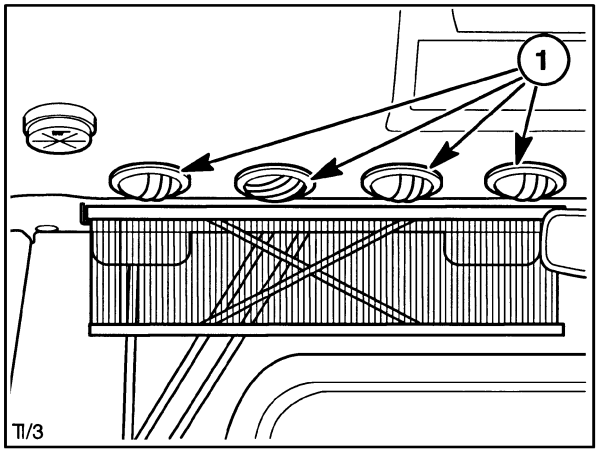
Never disconnect or disassemble any part of the air conditioner system. Escaping refrigerant will cause frostbite. Allowing refrigerant to escape into the atmosphere is illegal in many countries.

If refrigerant should contact the skin, use the same treatment as for frostbite. Warm the area with your hand or lukewarm water at 32 - 38° C (90 -100° F). Cover the area loosely with a bandage to protect the affected area and to prevent infection. Consult a doctor immediately.

*If refrigerant should contact the eyes, wash the eyes immediately with **cold** water for at least 5 minutes. Consult a doctor immediately.*

Swivelling Air Vents - Figure 19

Four swivelling vents (1) are installed in the roof. The vents may be independently adjusted to direct warm or cold air (with the blower control actuated) onto the windscreen and side windows or to the cab interior.



19

Radio/cassette Player (where fitted) - Figure 20

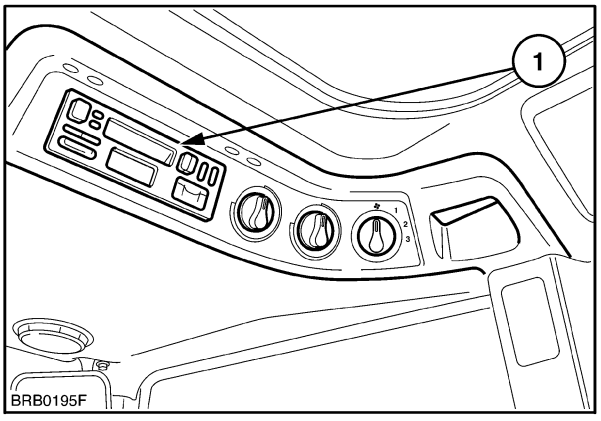
The cab has two speakers installed in the roof and is pre-wired to aid installation of a radio/cassette player. A choice of self-seeking AM/FM stereo radio/cassette players (1) are available as a dealer installed accessories. Separate operating instructions will be supplied with the set.

NOTE: *Radio may differ to that illustrated.*

WARNING

If an extended aerial is installed (for CB radio, etc.,) ensure that the aerial is positioned so it cannot touch overhead power lines.

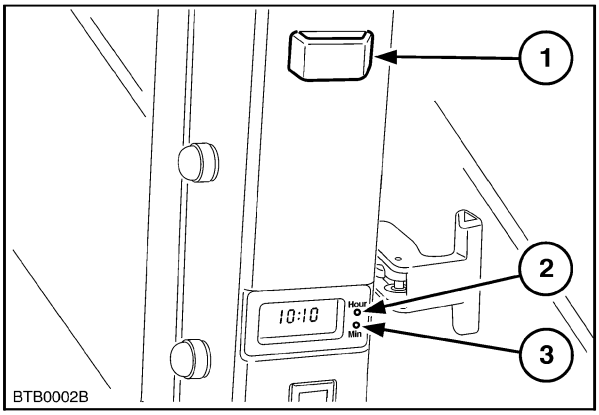
NOTE: *The radio will only operate with the key-start switch in the **on** or **accessories** position.*



20

Mobile Telephone Useage - Figure 21

A storage bracket (1) is provided on the right-hand 'B' pillar for a mobile telephone. Auxiliary power for the telephone may be taken from the cigarette lighter socket.



21

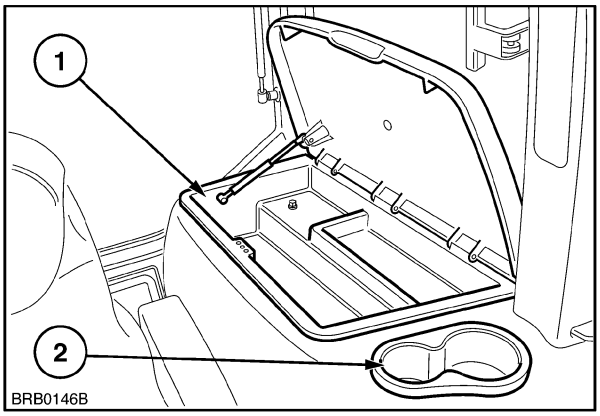
Clock - Figure 21

A digital clock is installed in the right-hand 'B' pillar. The clock will operate in the 12-hour or 24-hour mode.

To change to 24-hour display, press both buttons (2) and (3) simultaneously. Press both buttons again to revert back to the 12-hour display.

To adjust the hour display, press the button (2). Each time the button is pressed, the display will advance by 1 hour. Alternatively, hold the button in and the display will advance by 1 hour approximately every second. Release the button when the hour display is correct.

Repeat the procedure using button (3) to advance the minute display.



22

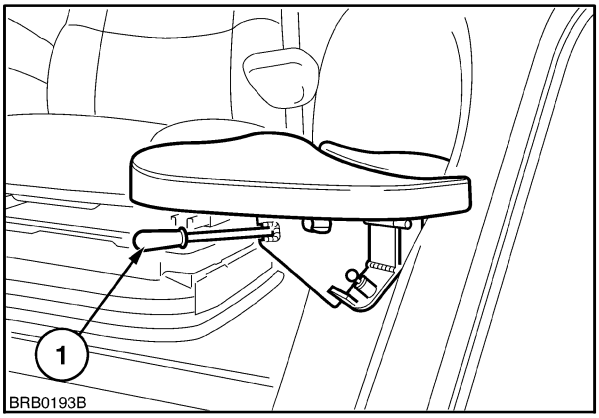
In Cab Storage Box - Figure 22

A storage box (1) with a hinged lid is located in the rear, left-hand corner of the cab. A drinks holder (2) is also provided.

Passenger Seat (where fitted) - Figure 23

A folding passenger seat is available in certain markets. The seat is shown in the operating position. When not required, fold the seat down. To fold the seat, grasp the front edge and lift it approximately 10 mm (0.5 in.) and swivel the lever (1) to the right (as viewed from the operator's seat).

IMPORTANT: *Do not carry a passenger unless a passenger seat is installed. In some countries, it is illegal to carry passengers under any circumstances. Consequently, a passenger seat is not available in those markets.*

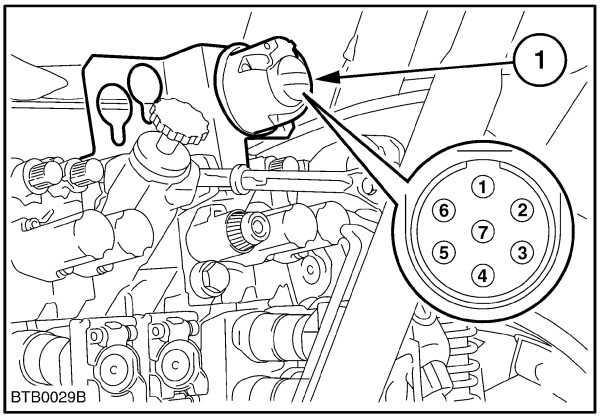


23

AUXILIARY ELECTRICAL POWER AND IMPLEMENT MONITOR MOUNTING

Trailer Lighting Socket (except N. America) - Figure 24

A standard 7-pin trailer lighting socket (1) is provided and is mounted on on a plate on the outside of the cab frame, beneath the rear window. The position of the socket may vary from that shown in Figure 24, dependent upon type of remote control valves installed, etc. The socket connections are as follows:



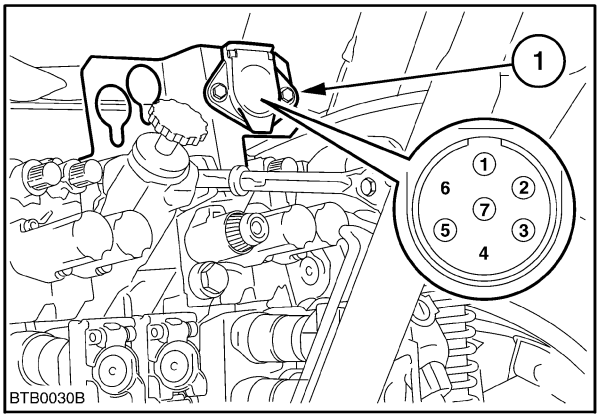
24

Pin No./Wire Colour (see inset - Figure 24)		Circuit
1	Green/red	L.H. Turn Signal
2	-	Not used
3	Black	Earth
4	Green/white	R.H. Turn Signal
5	Red	R.H. Parking Light
6	Green/purple	Stop Lights
7	Red/black	L.H. Parking Light

Trailer Lighting Socket (N. America only) - Figure 25

A standard 7-pin trailer lighting socket (1) is provided and is mounted on on a plate on the outside of the cab frame, beneath the rear window. The position of the socket may vary from that shown in Figure 25, dependent upon type of remote control valves installed, etc. The socket connections are as follows:

NOTE: *Pin number 2, Figure 25, may be used to provide power for an implement work light.*



25

Pin No./Wire Colour (see inset - Figure 25)		Circuit
1	Black	Ground
2	Red/black	Parking light/implement light
3	Green/red	L.H. Turn Signal
4	-	Not used
5	Green/white	R.H. Turn Signal
6	Red/black	Parking Light
7	-	Not used

Electrical Power Panel and Monitor Mounting - Figure 26

A power panel is provided on the right-hand rear quarter panel housing a variety of optional electrical outlets. The optional features are as follows:

(1) **Cigar/cigarette lighter.** Press the lighter button fully in to activate. When the lighter element has reached the correct temperature it will pop out ready for use.

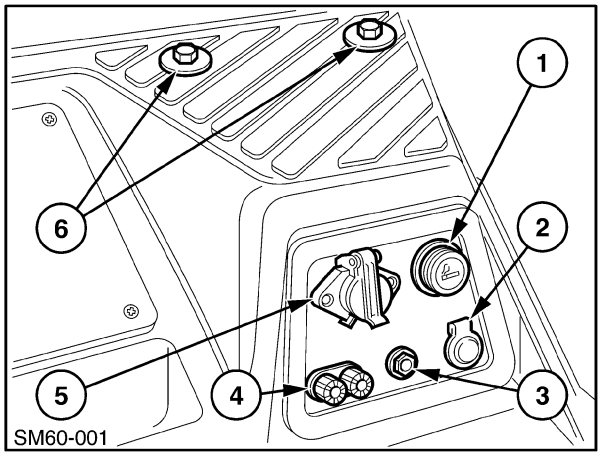
(2) **12 volt, 8 amp socket.** To power electrical monitoring equipment. The socket is live when the key-start switch is turned on.

(3) **Implement status socket).** This socket may be used to turn the Performance Monitor area accumulation on and off by means of an implement-mounted switch. See 'Area Accumulator' on page 2-47.

(4) **Live, 2-pin, 8 amp screw terminals.** The red terminal is positive, the black terminal being negative. Loosen a terminal nut, insert the bared end of the wire through the hole in the stud, then tighten the nut.

(5) **Live, 4-pin, 40 amp socket.**

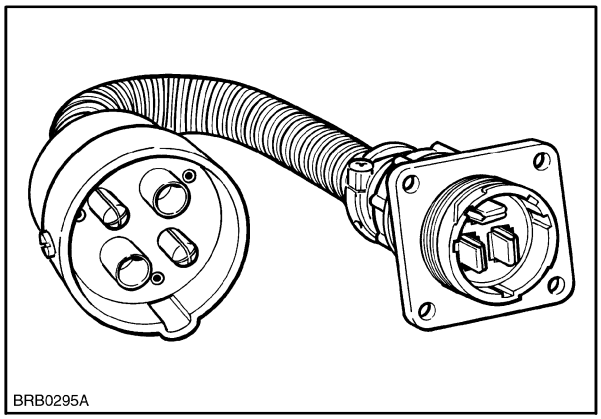
Immediately above the power panel, provision is made to mount an implement monitor, utilising the two bolts (6).



26

4-pin to 3-pin adaptor - Figure 27

A 4-pin to SAE 3-pin adaptor cable is available as an accessory from your New Holland dealer. The adaptor may be used with the 4-pin socket - item (5) in Figure 26.



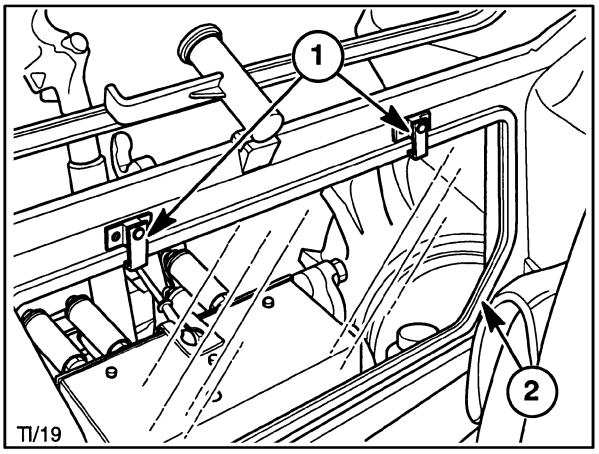
27

Monitor Cable Routing - Figure 28

So the operating cable from the monitor may be conveniently routed to the equipment, a small opening is provided in the lower rear window.

The window panel has a triangular cut-out (2) which, in the normal position is in the lower, right-hand corner (as viewed from inside the tractor).

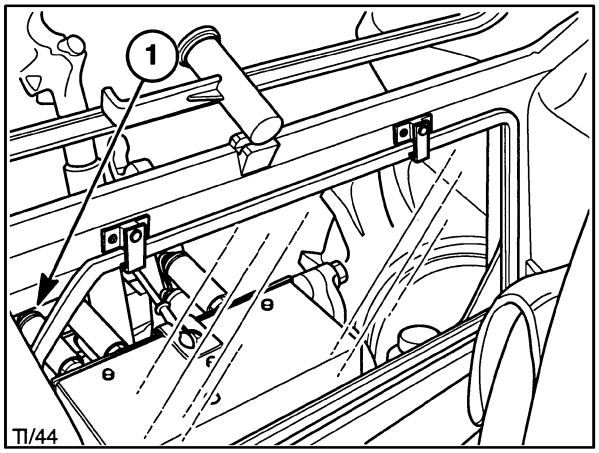
To rotate the window, release the two upper swivel clamps (1) and lift the glass panel from the support brackets.



28

Figure 29

Rotate the glass panel 180° and re-install with the cut-out (1) in the upper, left-hand corner (as viewed from inside the tractor) and the soft rubber seal facing rearward (toward the cab frame). Secure the panel with the two swivel clamps.

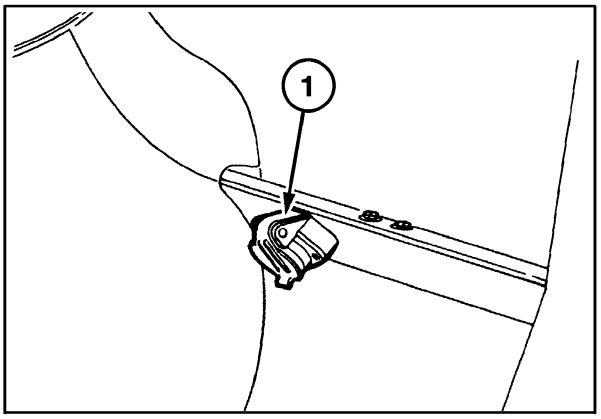


29

Additional 40 amp socket - Figure 30

A second 4-pin, 40 amp socket is available as a dealer installed accessory. The socket is mounted on the underside of the lower, right-hand windscreen frame.

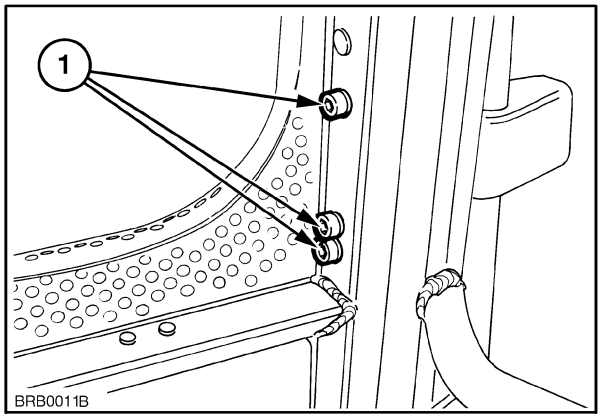
A 4-pin to SAE 3-pin adaptor cable is available as an accessory from your New Holland dealer. (See Figure 27).



30

Alternative Monitor Mounting

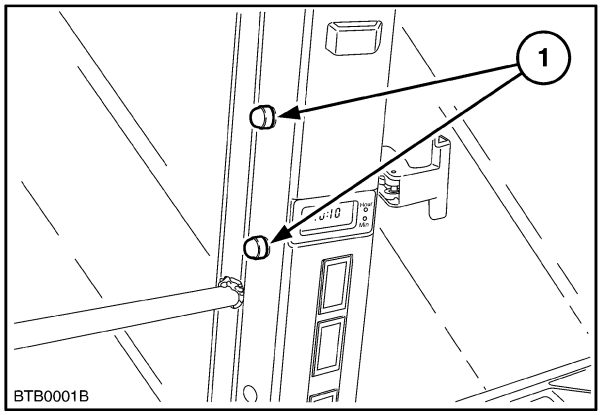
Alternative implement monitor mounting positions are provided on the rear face of the right-hand ‘A’ pillar and on the front face of the right-hand ‘B’ pillar.



31

Figure 31

Three holes, with 10 mm captive nuts and socket head bolts, (1) Figure , are provided on the ‘A’ pillar. Use the socket head bolts to install the monitor.



32

Figure 32

Two holes, with 10 mm captive nuts and hexagon head bolts (1)are provided on the ‘B’ pillar. Remove the plastic covers from the bolts and use the bolts to install the monitor.

It is recommended that a suitable hinged bracket be screwed to the ‘A’ or ‘B’ pillar to mount the monitor. This will allow the monitor to be swung to one side so as not to impede access to or from the cab.

CLEANING THE CAB INTERIOR

When the soft trim material inside the cab becomes dirty, it should be wiped clean. Dip a cloth in a warm water/detergent solution and wring out as much of the water as possible.

The rubber floor covering is designed to allow water to flow out through the open doors. Wash the covering carefully and allow to dry naturally. Avoid getting water under the mat.

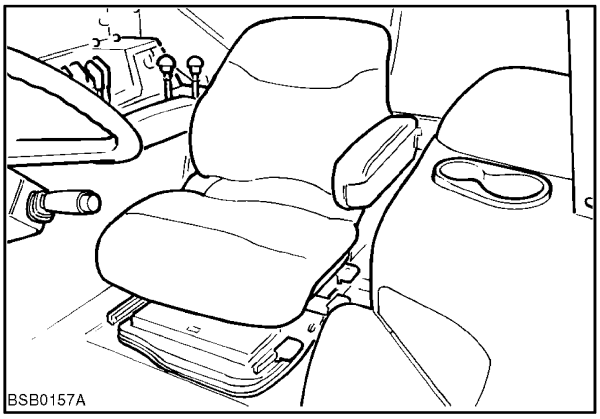
SEATS

Two air suspension seats are available. Whichever seat is installed in your tractor, you will find that it has a comprehensive range of adjustments.

Before operating the tractor, it is important to adjust the seat to the most comfortable position. Seat adjusters are colour coded grey. See the following text and illustrations for details.

STANDARD AIR SUSPENSION SEAT

The standard air suspension seat is shown in Figure 33. All seat adjustments should be made while sitting in the seat.



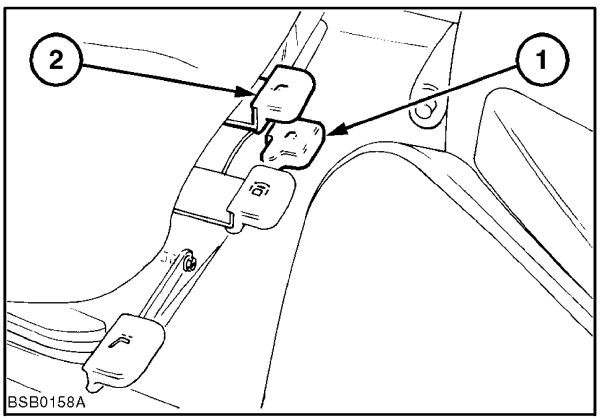
33

Height/weight adjustment - Figure 34

The standard air suspension seat has electrically controlled, pneumatic suspension. In order to adjust seat height, it is necessary to turn the key-start switch on. Lift the lever (1) and a compressor will raise the seat. When the lever is released the seat will stop at the height selected. Push the lever down to release air and lower the seat.

Backrest adjustment - Figure 34

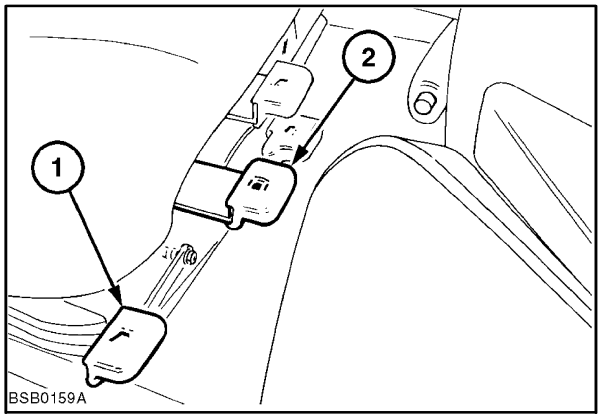
Lift the lever (2) on the left-hand side of the seat frame and adjust the inclination of the backrest. The backrest will lock in position when the lever is released.



34

Travel adjustment - Figure 35

Lift the travel adjustment lever (1) and move the seat forward or backward, as required. The seat will lock in position when the lever is released.



35

Swivel adjustment - Figure 35

To aid observation to the rear of the tractor, the seat may be allowed to swivel. Adjustment is available as follows:

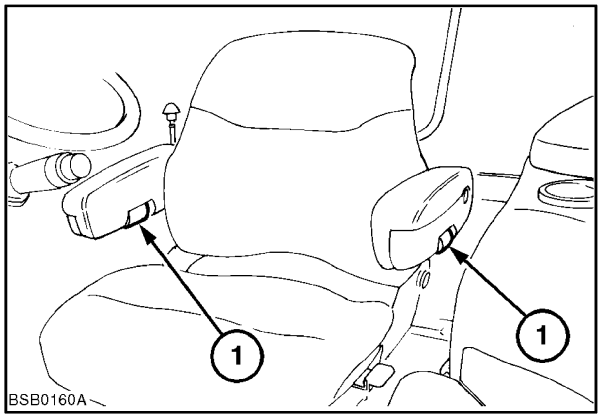
a) Lock in one position 7° to the left of centre.

b) Lock in one of three positions at 7°, 14° and 21° to the right of centre.

To swivel the seat, partially lift the handle (2), then rotate the seat to the required position. When the lever is released, the seat will lock at the selected angle.

Armrest angle adjustment - Figure 36

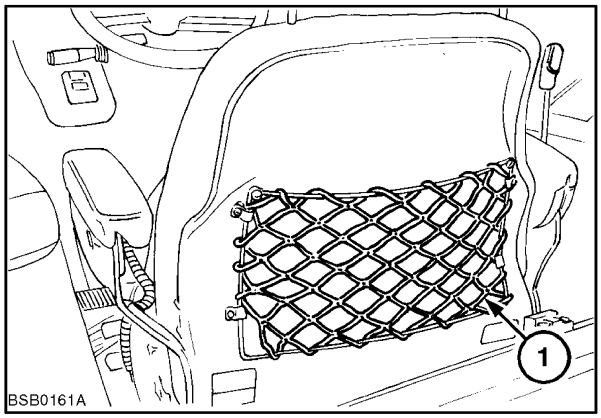
Rotate the knurled wheel (1) on the underside of each armrest to adjust the angle of the armrest to a comfortable position. When not required, both armrests may be lifted to the vertical position.



36

Storage net - Figure 37

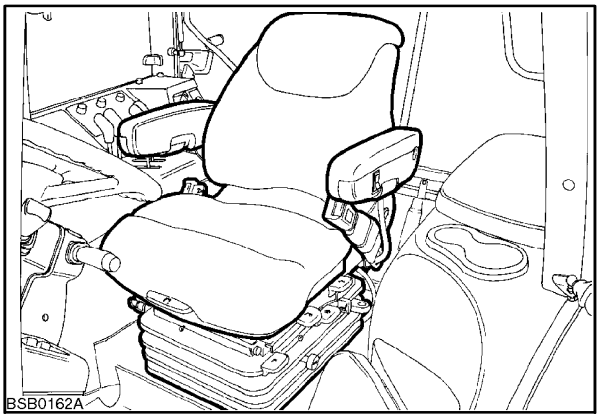
A net (1) for storing documents, etc., is provided on the back of the seat.



37

DELUXE AIR SUSPENSION SEAT

The deluxe seat is shown in Figure 38. All seat adjustments should be made while sitting in the seat.



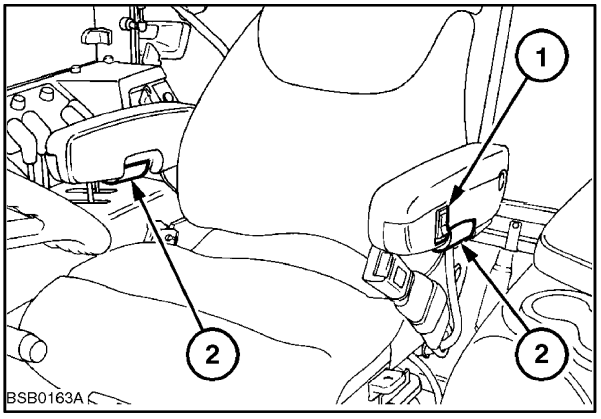
38

Height/weight adjustment - Figure 39

The deluxe air suspension seat has electrically controlled, pneumatic suspension. In order to adjust seat height, it is necessary to turn the key-start switch on. Press and hold the top of the rocker switch (1) and a compressor will raise the seat. When the switch is released the seat will stop at the height selected. Press the bottom of the switch to release air and lower the seat.

Armrest angle adjustment - Figure 39

Rotate the knurled wheel (2) on the underside of each armrest to adjust the angle of the armrest to a comfortable position. When not required, both armrests may be lifted to the vertical position.



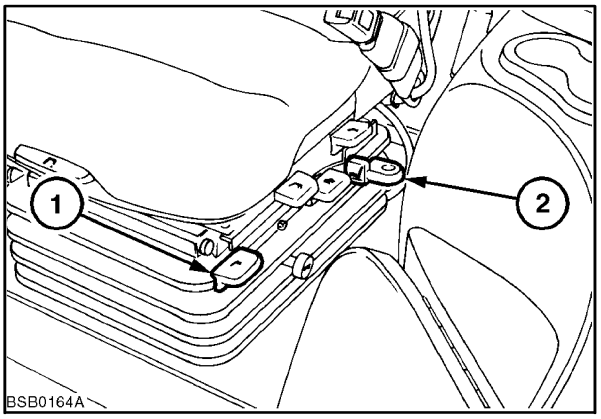
39

Travel adjustment - Figure 40

Lift the travel adjustment lever (1) and move the complete seat forward or backward, as required. The seat will lock in position when the lever is released.

Travel isolator - Figure 40

Having selected the required fore/aft position, the seat is permitted a limited, spring controlled, fore/aft movement (float) if the travel isolator (2) is pulled up. This, in conjunction with the air suspension, will provide the optimum in ride comfort. To cancel the float movement, push the travel isolator down while slowly moving the seat fore and aft until the seat locks in position.



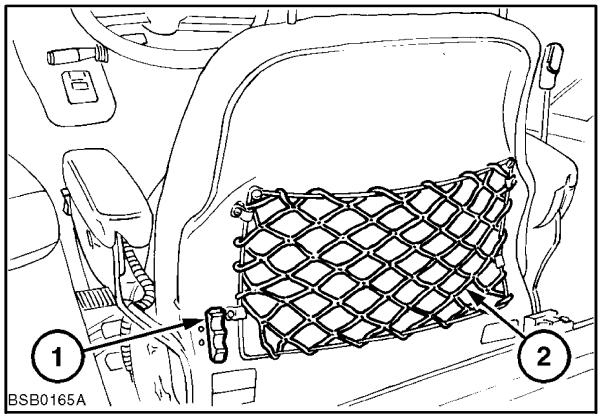
40

Lumbar adjustment - Figure 41

The seat has a built-in lumbar support actuated by a handwheel (1) located on the back of the seat on the left-hand side. Rotate the handwheel upwards to increase lumbar support. Rotate downwards to reduce lumbar support.

Storage net - Figure 41

A storage net (2) for documents, etc., is provided on the back of the seat.



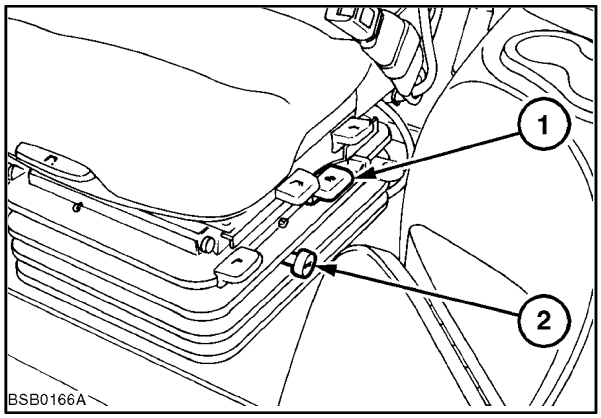
41

Swivel adjustment - Figure 42

To facilitate observation of an implement attached to the rear of the tractor, the seat may be allowed to swivel. Adjustment is available as follows:

a) Lock in any position between 7° to the left and 21° to the right of centre.

To swivel the seat, move the handle (1) partially to the rear then rotate the seat to the required position. When the lever is released, the seat will lock at the selected angle. Move the handle fully rearward to select the free swing position (where fitted).



42

Suspension damper - Figure 42

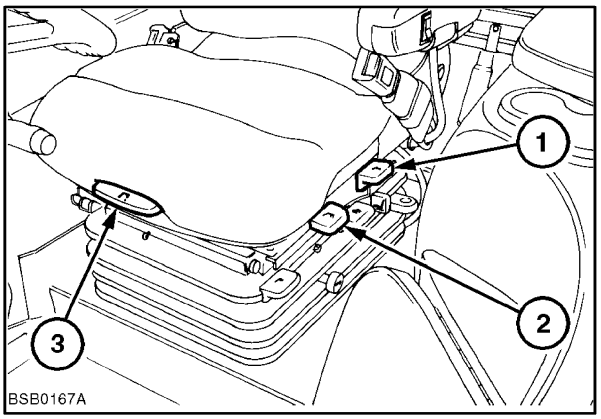
Turn the knob (2) clockwise (toward the rear) for a softer ride. Turn anti-clockwise if a firmer ride is required.

Backrest inclination adjustment - Figure 43

Lift the lever (1) on the left-hand side of the seat frame and adjust the inclination of the backrest. The backrest will lock in position when the lever is released.

Seat cushion extension - Figure 43

To suit drivers of differing heights, the length of the seat cushion may be adjusted by up to 60 mm (2.4 in). Lift the lever (2) and move the cushion forward or rearward, as required. The cushion will lock in position when the lever is released.



43

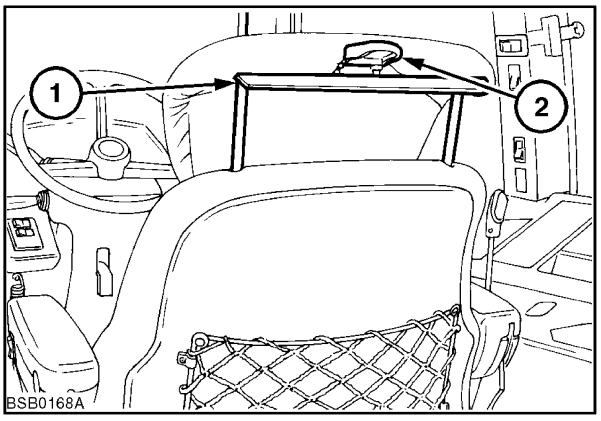
Seat cushion tilt - Figure 43

The angle of the seat cushion may be adjusted to three positions. Lift the lever (3) and pull or push the front of the seat cushion up or down, as required. The seat cushion will lock in position when the lever is released.

Shoulder support - Figure 44

The deluxe seat features an integrated shoulder support (upper backrest). The support may be adjusted vertically and horizontally. To adjust the height, pull the support plate (1) upwards. Push down on the top of the shoulder support to lower.

Lift the lever (2) and move the shoulder support forward or backward, as required. Adjustment is provided in four positions. Release the lever to lock the shoulder support in position.

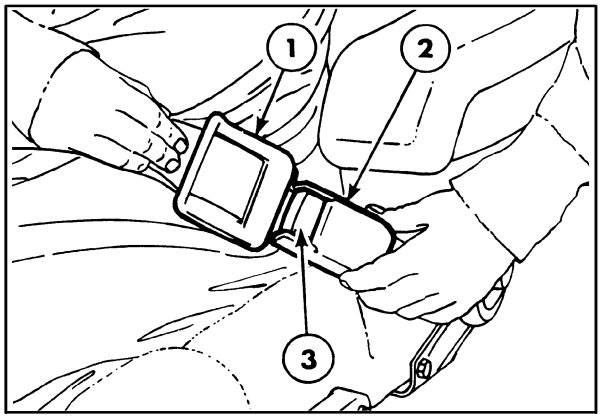


44

Seat Belt - Figure 45

⚠ WARNING ⚠

In some countries, tractors equipped with a safety cab are also fitted with a retractable seat belt. Always use the seat belt with a safety cab installed. Do not use a seat belt if the tractor is not equipped with a safety cab.



45

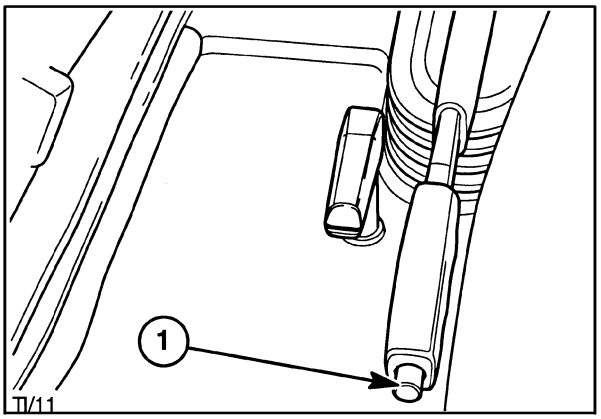
To fasten the belt, pull the belt from the reel and push the tongue (1) into the buckle end (2) until a 'click' indicates it is properly engaged. To disengage, press the red release button (3) on the buckle and remove the tongue from the buckle.

The belt may be sponged with clean, soapy water. Do not use solvents, bleach or dye on the belt as these chemicals will weaken the webbing. Replace the belt when it shows signs of fraying, damage or general wear.

HANDBRAKE, THROTTLE AND FOOT CONTROLS

Handbrake - Figure 46

The handbrake lever is installed to the left of the driver's seat. To apply the handbrake, pull the lever up. To release, ease the lever up further, press the button (1) on the end and lower the lever fully.

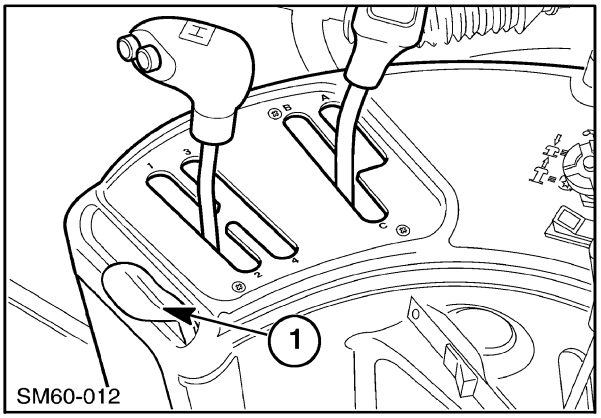


46

IMPORTANT: *Ensure that the handbrake is fully released before driving off.*

Hand Throttle - Figure 47

The throttle lever (2) controls engine speed. Push the lever forward to progressively increase engine speed. Pull rearward to reduce engine speed.

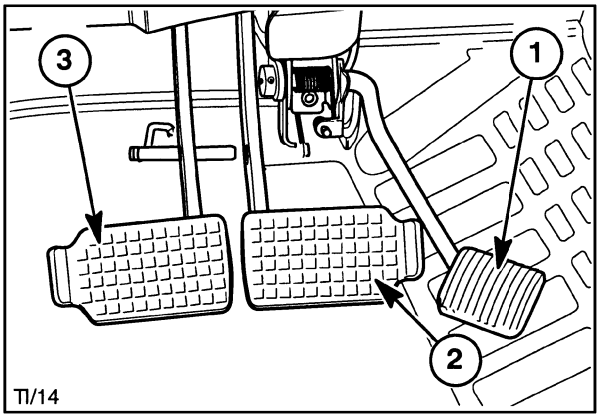


47

Foot Throttle - Figure 48

The foot throttle (1) may be used independently of the hand throttle to control the speed of the tractor. It is recommended that you use the foot throttle when driving on the highway.

NOTE: *When the foot throttle is released, engine speed will reduce to the level set by the hand throttle. When using the foot throttle, set the hand throttle to the minimum speed position (lever fully rearward).*



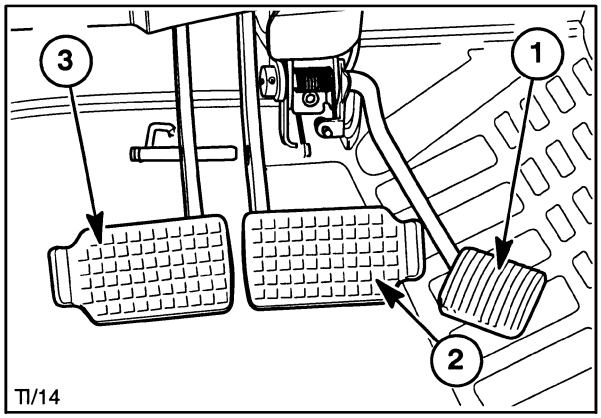
48

Footbrakes - Figure 49

WARNING

On four wheel drive tractors, the drive to the front axle is automatically engaged when both brake pedals are applied simultaneously to provide four wheel braking. Additionally, you may also have the optional front disc brakes. Whichever system is installed, you should be aware of the effectiveness of four wheel braking which greatly enhances braking performance. Appropriate care should be exercised during heavy braking.

The brakes are actuated by two foot pedals (2) and (3). They may be operated independently, to aid turning in confined spaces or locked together for normal stopping. When operating in the field, the brake pedals may be unlocked, as shown in Figure 49. However, due to the close proximity of the pedals to one another, it is still possible to apply both brakes together, when required.

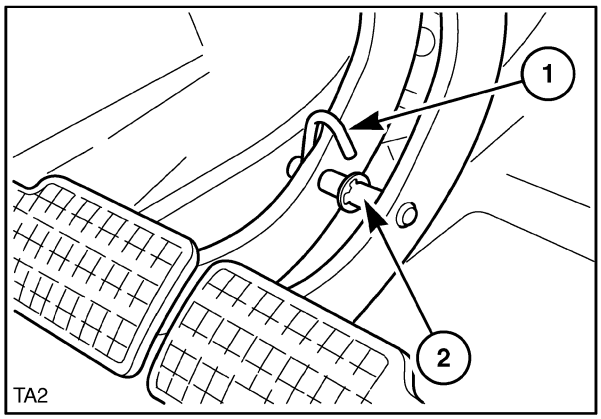


49

Figure 50

WARNING

For your safety, always lock the brake pedals together when travelling at transport speeds or if a hydraulically braked trailer is attached to the tractor. To lock the pedals together, slide the bolt (2) to the right, to engage the hole in the right-hand pedal shank and push the hooked end (1) down, as shown, to engage the left-hand pedal shank.

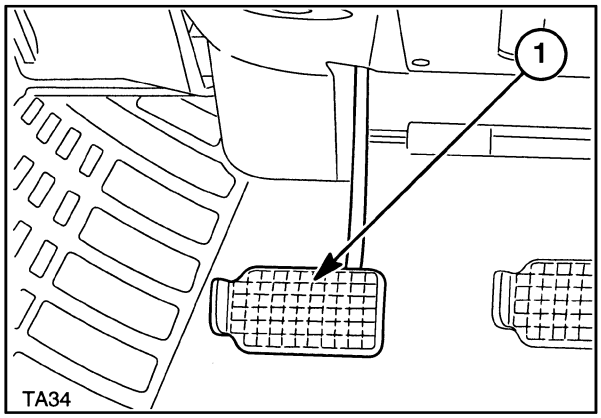


50

Clutch/Inching Pedal - Figure 51

When the clutch pedal (1) is depressed the drive between the engine and transmission will be disengaged. Use the pedal to transfer engine power smoothly to the driving wheels when moving off from a standstill. See 'TRANSMISSION' later in this section for further details.

NOTE: *To avoid premature wear, do not use the clutch pedal as a footrest.*



51

INSTRUMENT CONSOLE

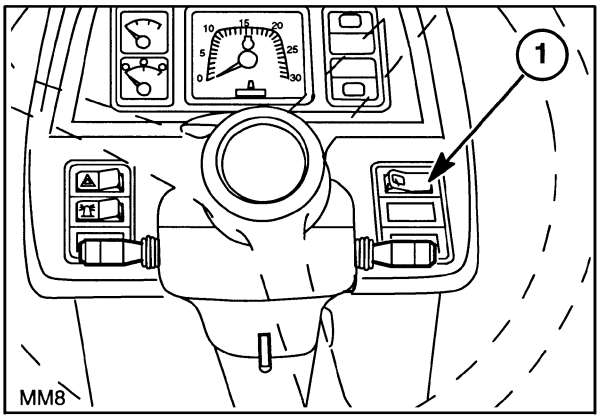
The following text describes the use of the various switches and controls, etc., mounted on the instrument console and steering column.

Rear Window Wipe/Wash Control (where fitted) - Figure 52

When the key-start switch is turned on, the rocker switch will be internally illuminated.

Press the left-hand side of the rocker switch (1) partially in to actuate the rear wiper, in intermittent mode. Press fully in to actuate the washer and wiper. The switch is spring-loaded and will return to the 'wiper on' position when released.

Press the right-hand side of the switch to turn the wiper off.



52

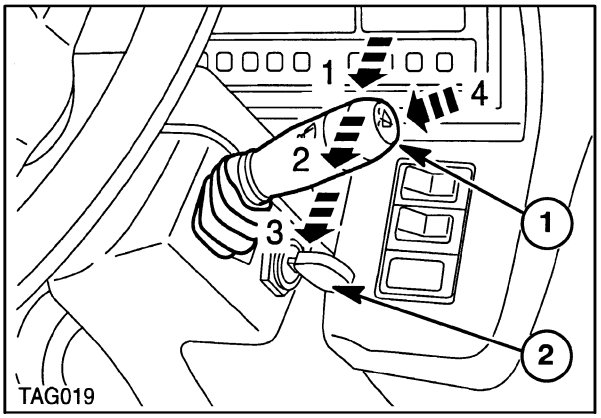
Front Windscreen Wipe/Wash Control - Figure 53

The stalk-type control (1) on the right-hand side of the steering column controls the front screen wiper and washer.

With the key-start switch on, move the stalk rearward, to position 1 and the wiper will operate in intermittent mode, sweeping the screen once every 5 seconds.

Move the stalk further rearward, position 2, to operate the slower of the two wiper speeds. Move the stalk fully rearward, position 3, and the higher wiper speed will be selected. Press in the end of the stalk, position 4, to operate the electric screen washer.

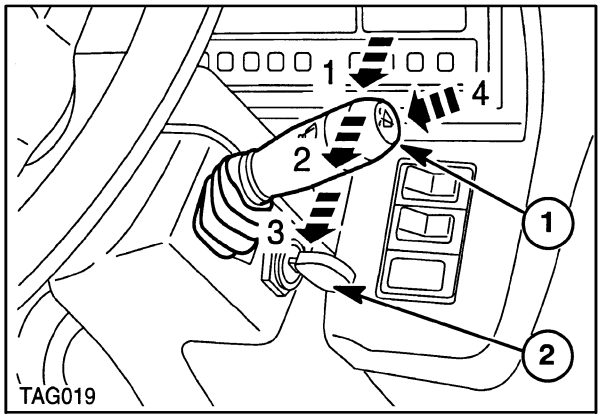
NOTE: *Both front and rear (if fitted) washer jets are mounted in the centre of the cab frame, immediately beneath the roof. Insert a pin into the jet nozzle to adjust the angle of the jet.*



53

Key-start Switch - Figure 54

The key-start switch (2) activates the Thermostart cold start device and the starting motor. See 'Starting the Engine' on page 3-2.

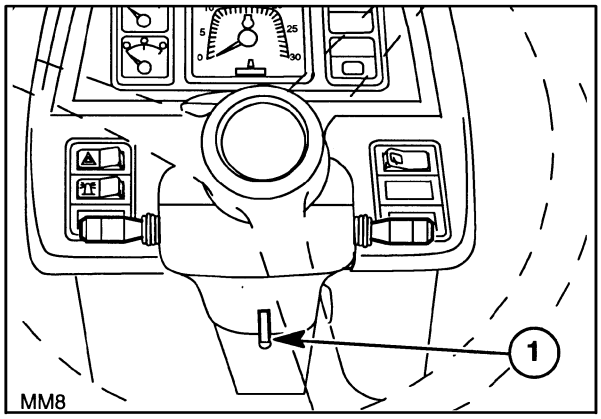


54

Steering Column Clamp Lever - Figure 55

The steering column may be tilted and telescoped by releasing the clamp lever (1). Move the steering column/wheel to the most convenient position and push the clamp lever forward to lock the steering column assembly.

IMPORTANT: *Your tractor is equipped with hydrostatic power steering. Never hold the steering wheel at full left or right lock (wheels against the steering stops) for more than 10 seconds or for more than a total of 10 seconds in any one minute. Failure to observe this precaution may result in damage to steering system components.*



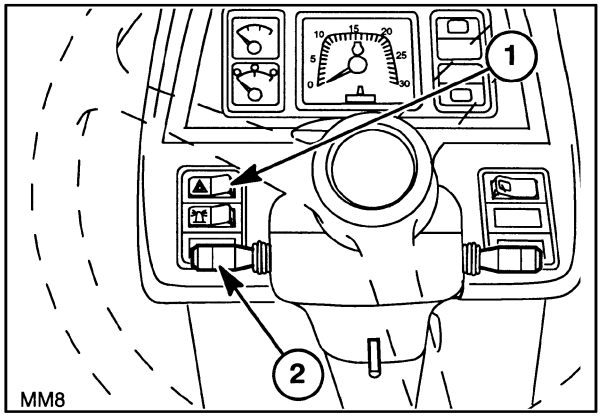
55

Hazard Warning Lights Switch - Figure 56

Press the left-hand side of the switch (1) to operate all the turn signals simultaneously. The switch will flash in unison with the turn signals.

Multi-function Switch - Figure 56

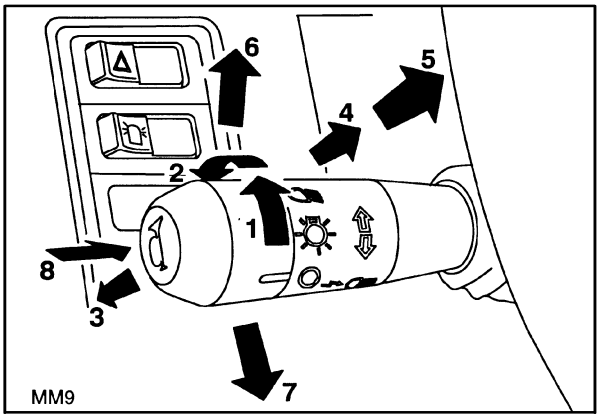
The stalk-type switch shown at (2) is detailed in Figure 57. The switch, mounted on the left-hand side of the steering column, operates the tractor lights, horn and turn signals.



56

Figure 57

Rotate the stalk forward to the first position 1 to turn on the tractor side lights and instrument lights. Rotate the stalk to the second position 2 to turn on the headlights. With the headlights switched on, push the stalk down (position 3) to select main beam, pull up (position 4) for dipped beam. Pull the stalk further up, against spring pressure (to position 5) to flash the headlight main beams. The headlight flash will function with the tractor lights on or off.



57

To operate the right-hand turn signals, move the stalk forward to position 6. The left-turn signals will operate if the stalk is pulled rearward to position 7. The turn signal indicator lights on the instrument panel will also flash when the turn signals are actuated. A warning buzzer will sound if the indicators are not cancelled within 40 seconds.

NOTE: *The turn signals will only operate with the key-start switch turned on.*

Press in the end of the stalk (8) to sound the horn.

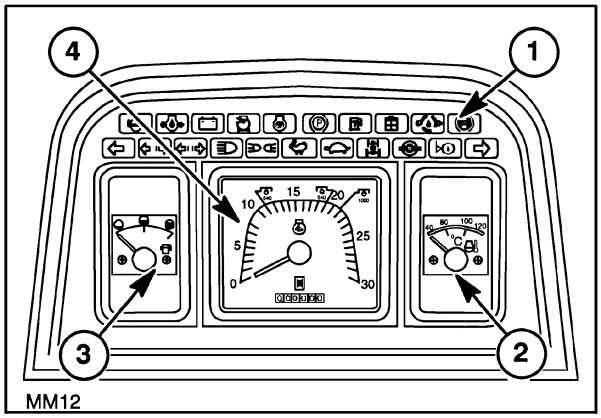
ANALOGUE AND ANALOGUE/-DIGITAL INSTRUMENT PANELS

Two types of analogue instrument panel are available, dependent upon model and specification level. Figure 58 shows the analogue instrument panel. The analogue/digital version is shown in Figure 59.

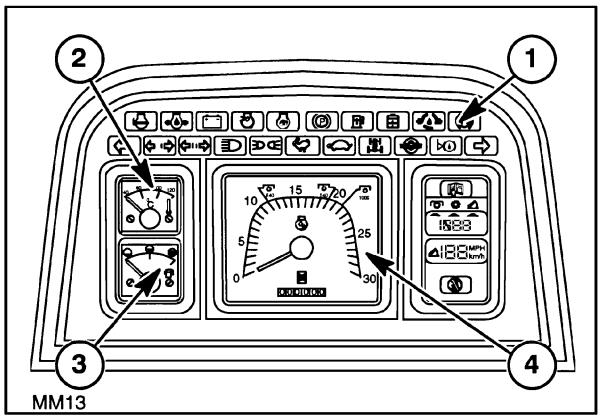
The upper section of both instrument panels consists of 21 coloured lights (1) which provide operating information or give warning of system malfunction.

Both instrument panels have three analogue gauges (2), (3) and (4). The panel shown in Figure 59 has, in addition, a liquid crystal display (LCD) on the right-hand side with two additional warning lights.

The instruments and liquid crystal display area are illuminated when the tractor lights are turned on. The instrument panel is also equipped with an audio alarm function.



58



59

GAUGES

Please refer to Figure 58 or 59, as appropriate, and the following text.

Engine Coolant Temperature Gauge - Figure 58 and 59

The temperature gauge (2) indicates the temperature of the engine coolant. If the needle enters the right-hand (red) section of the gauge while the engine is running, stop the engine and investigate the cause.

Fuel Gauge - Figure 58 and 59

The gauge (3) indicates the level of fuel in the tank(s) and is only operative with the key-start switch turned on.

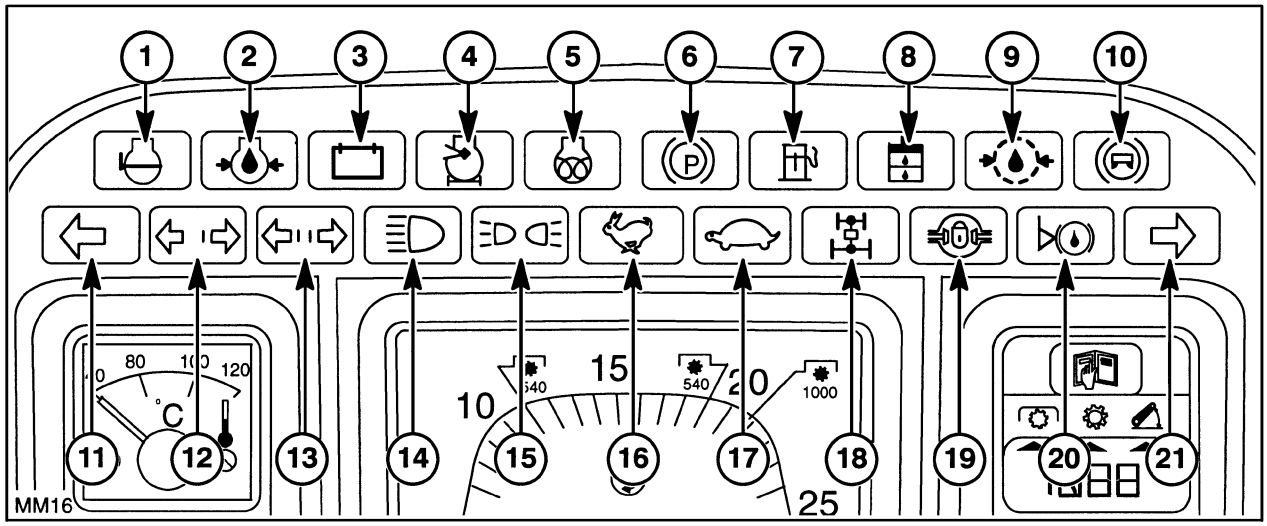
Proofmeter - Figure 58 and 59

The proofmeter (4) consists of an hourmeter and tachometer. The hourmeter records the total number of hours that the tractor has operated. The hours recorded should be used as a guide to determine hourly servicing intervals.

The tachometer indicates engine revolutions per minute. Each division on the scale represents 100 rev/min., therefore with the needle indicating '20' the engine is running at 2000 rev/min.

There are three P.T.O. symbols on the tachometer scale. The white '540' P.T.O symbol indicates the engine speed at which a P.T.O. speed of 540 rev/min is obtained. The yellow '540' symbol indicates the engine speed at which a P.T.O. speed of 540 rev/min is obtained in the economy range.

The white '1000' symbol indicates the engine speed at which the 1000 rev/min P.T.O. speed is obtained.



60

Indicator and Warning Lights - Figure 60

The twenty one coloured lights, shown in Figure 60, provide operating information or give warning of system malfunction. The lights are common to both instrument panels and their illumination may be accompanied by a critical or non critical alarm sound. See 'Audible Alarm' on page 2-35.

The lights function as follows:

Upper Row - left to right

1. Engine coolant level - Flashing light indicates coolant is below a pre-set level. Stop the engine and investigate the cause. See Maintenance (Section 4).

2. Engine oil pressure - Steady light indicates low engine oil pressure. Stop the engine and investigate the cause.

3. Alternator - Steady light indicates that the alternator is not charging.

4. Air cleaner - Steady light indicates that the air cleaner is blocked or partially blocked. Stop the tractor and service the air cleaner to prevent damage to the engine.

5. Thermostart - Light will illuminate when the Thermostart is activated by the key-start switch. See 'Starting the Engine' on page 3-2.

6. Parking brake - With the key-start switch on, a flashing light indicates that the parking brake is applied.

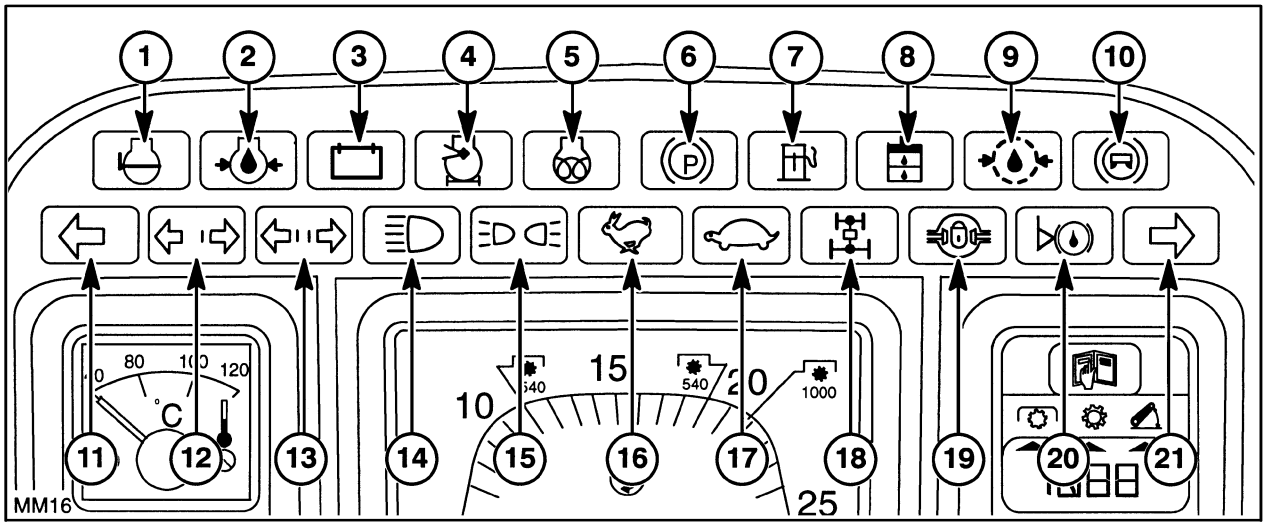
   If the key-start switch is turned off and the parking brake is not applied, an audible alarm will sound continuously for a minimum of two minutes or until the handbrake is applied.

⚠ WARNING ⚠

To avoid personal injury, always apply the parking brake before leaving the tractor seat.

7. Water in fuel - Light will illuminate if water is detected in the fuel. Stop the tractor and service the fuel filters to prevent damage to the fuel injection system.

8. Transmission oil filter blocked - Steady light accompanied by **non-critical** alarm indicates that the transmission oil filter(s) is/are blocked or partially blocked. Stop the engine and service the oil filter(s) to avoid damage to the transmission.



61

Figure 61

9. Transmission oil pressure low - Steady light indicates that the transmission lubrication circuit oil pressure is low. Stop the engine and investigate the cause.

   Tractors with CCLS pump only - Flashing light indicates that the charge pump intake and pressure filters are blocked or partially blocked causing low pump pressure. Service the tractor as soon as practicable and certainly within 1 hour of operation.

10. Trailer brake air pressure - Light will illuminate to indicate that air pressure to the pneumatic trailer brake circuit is low.

10. Trailer brake hydraulic oil pressure (Italy only) - Light will flash to indicate that oil pressure to the hydraulic trailer brake circuit is low.

Lower Row - left to right

11. Left turn indicator - Light will flash in unison with tractor left-hand turn signal.

12. Trailer turn signal - Light will flash in unison with tractor/trailer turn signals if trailer attached.

13. Trailer turn signal - Light will flash in unison with tractor/trailer turn signals if second trailer attached.

14. Headlight main beam - Light will be illuminated when the tractor lights are switched to main beam.

15. Parking lights - Light will be illuminated when the tractor lights are switched on.

16. 'Hi' drive indicator - Light will illuminate to indicate that the transmission is in 'Hi' drive (Dual Command transmission only).

17. 'Lo' drive indicator - Light will illuminate to indicate that the transmission is in 'Lo' drive (Dual Command transmission only).

18. Four wheel drive - Light will illuminate when the drive to the front wheels is engaged.

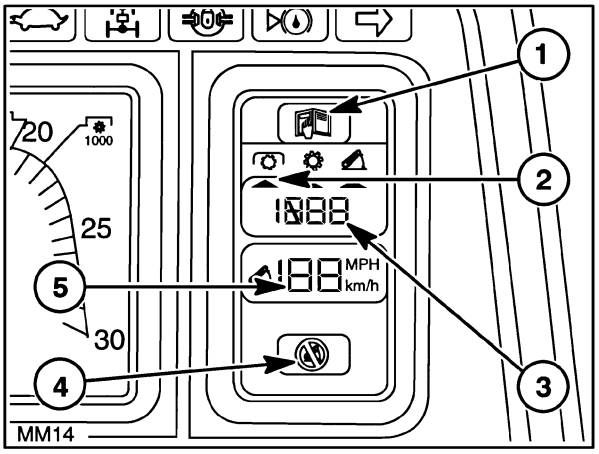
19. Differential lock - Light will illuminate when the differential lock(s) is/are in the engaged mode. See 'TerraLock Front and Rear Differential Lock' on page 2-101.

20. Steady light indicates that the brake/clutch fluid level is low. Stop the engine and investigate the cause.

21. Right turn indicator - Light will flash in unison with tractor right-hand turn signal.

LIQUID CRYSTAL DISPLAY (LCD) (Analogue/digital Instrument Panel Only) – Figure 62

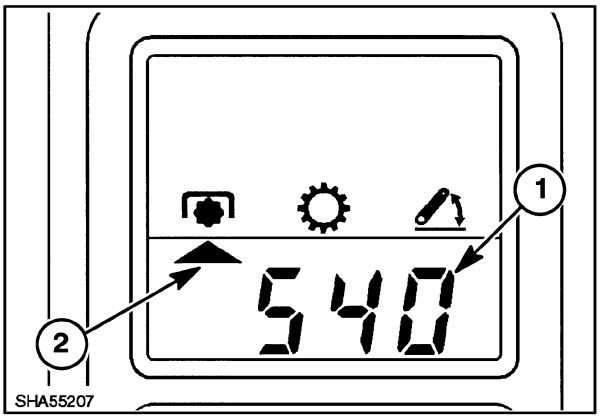
The right-hand panel is split into two separate displays, each having a warning light and an LCD. All the displays are shown activated, for reference purposes. See the following text.



62

Upper Digital Display – Figure 63

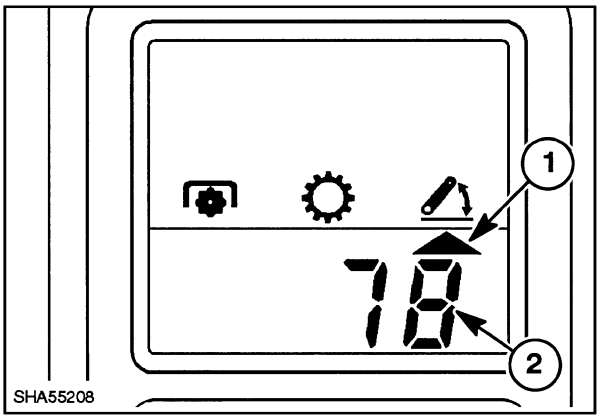
When the P.T.O is operating, the arrow (2) will display and point to the P.T.O. symbol. A digital display (1) of the rear P.T.O. shaft speed will appear below it. See ‘Power Take-Off’ on page 3-9.



63

Figure 64

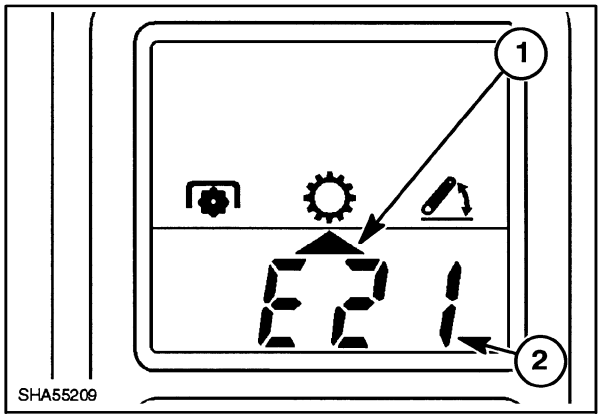
If your tractor is equipped with Electronic Draft Control (EDC) then, when the P.T.O. is disengaged the display will change. The arrow (1) will display and point to the 3-point linkage symbol. The digital display (2) beneath it indicates the position of the 3-point linkage (and implement) by means of numbers ranging from ‘0’ (fully lowered position) to ‘99’ (maximum lift height). The display also shows EDC error codes. See ‘Electronic Draft Control’ on page 3-45.



64

Figure 65

If your tractor has a Dual Command transmission, then the upper LCD will also automatically display transmission fault codes. The arrow (1) will display and point to the gear symbol. The fault code (2) will display and the malfunction warning light will illuminate. In the event of this happening, consult your authorised dealer.

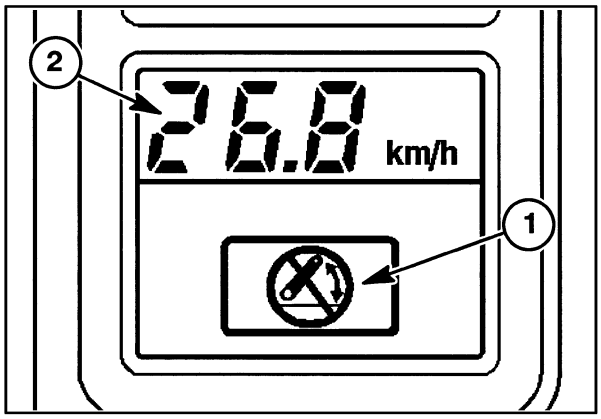


65

Lower Digital Display - Figure 66

The hitch disabled warning light (1) will illuminate when the 3-point linkage position is out of phase with the hydraulic lift control lever. See 'Electronic Draft Control' on page 3-45.

A permanent display of ground speed, in MPH or km/h, appears in the LCD (2). The display may be changed by using the switches on the electronic management unit adjacent to the right-hand window. See Figure 67.



66

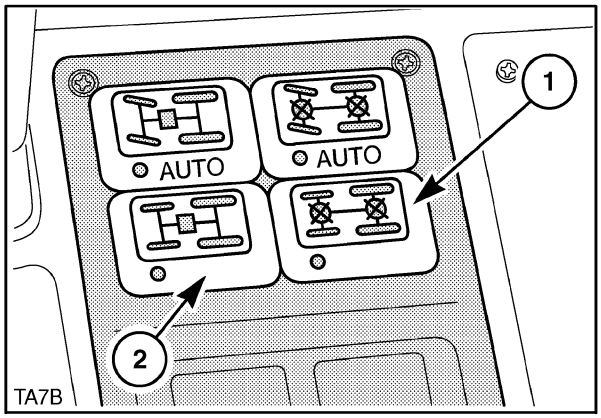
To change from MPH to km/h - Figure 67

Turn the key-start switch on while holding down the manual differential lock touch pad (1).

To change from km/h to MPH - Figure 67

Turn the key-start switch on while holding down the manual four wheel drive touch pad (2).

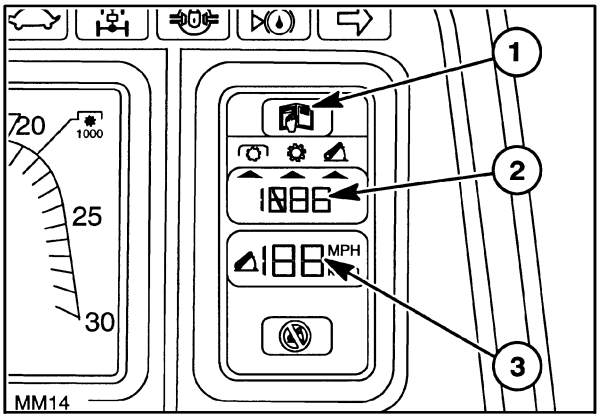
NOTE: *The pads are incorporated in the Electronic Management Unit (EMU). Some models will have a unit with only three touch pads, but the two lower pads are still used to change from MPH to km/h and vice versa, as described above.*



67

Malfunction Warning Light - Figure 68

In the unlikely event that a malfunction occurs in an electrical circuit, the malfunction warning light (1) will flash for approximately 5 seconds accompanied by an fault code in one of the LCD's (2) or (3). Consult your authorised dealer.

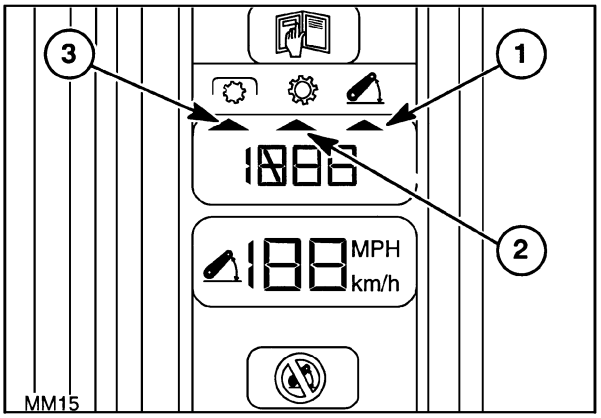


68

Malfunction Warning Light - Figure 69

To indicate the area of the malfunction, one of the three arrows (1), (2) or (3) will flash. The symbol immediately above each arrow indicates the main area in which the fault has occurred, as follows:

a) Hydraulic lift system
b) Transmission
c) Any Electronic Management Unit function (PTO, differential locks FWD, etc.)



69

ATTENTION: *Fault codes shown on the LCD are considered to be of a critical nature and therefore the tractor will be stopped. The fault code and warning light will continue to flash until the fault is rectified or the key-start switch turned off. In this event, the tractor will require the attention of your dealer.*

NOTE: *Every time the key-start switch is turned on, the malfunction warning light and fault code will flash for a short period.*

ELECTRONIC INSTRUMENT PANEL

Figure 70

The electronic instrument panel is shown with all the displays activated.

The upper section consists of 21 coloured lights (1) which provide operating information or give warning of system malfunction.

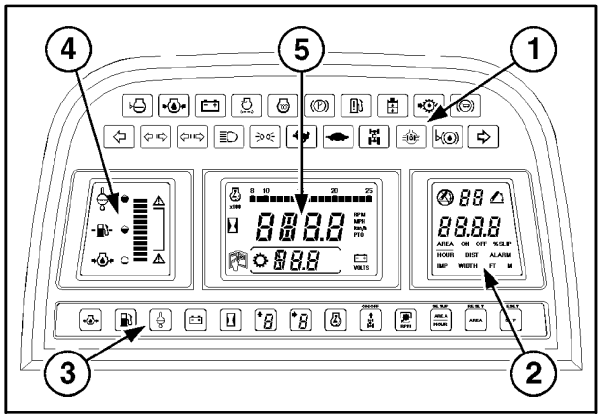
Thirteen touch-sensitive selector buttons (3) are arranged in a line across the bottom of the instrument panel. Touching these buttons enables information on various tractor functions to be displayed in the three liquid crystal display (LCD) areas.

The left-hand display (4) is in the form of a bargraph. Touching the appropriate function button will cause corresponding information on engine coolant temperature, fuel level and engine oil pressure to be displayed in the bargraph.

The main, central panel (5) consists of a multi- function LCD activated by the function selector buttons. A numerical read out of the following functions may be displayed:

- Engine speed (rev/min)
- Engine hours operated (actual time)
- Tractor ground speed (MPH or Km/h)
- P.T.O. speed (rev/min)
- Battery condition (volts)
- Gear ratio selected (Dual Command transmission only)
- Diagnostic error codes (tractor circuits and transmission - will display automatically if a malfunction occurs). Consult your authorised dealer.

In addition to the numerical display, engine speed is continuously displayed in the form of a bargraph across the top of the main display. A warning indication may be programmed into the display as a reminder to the operator that the next scheduled service is due.



70

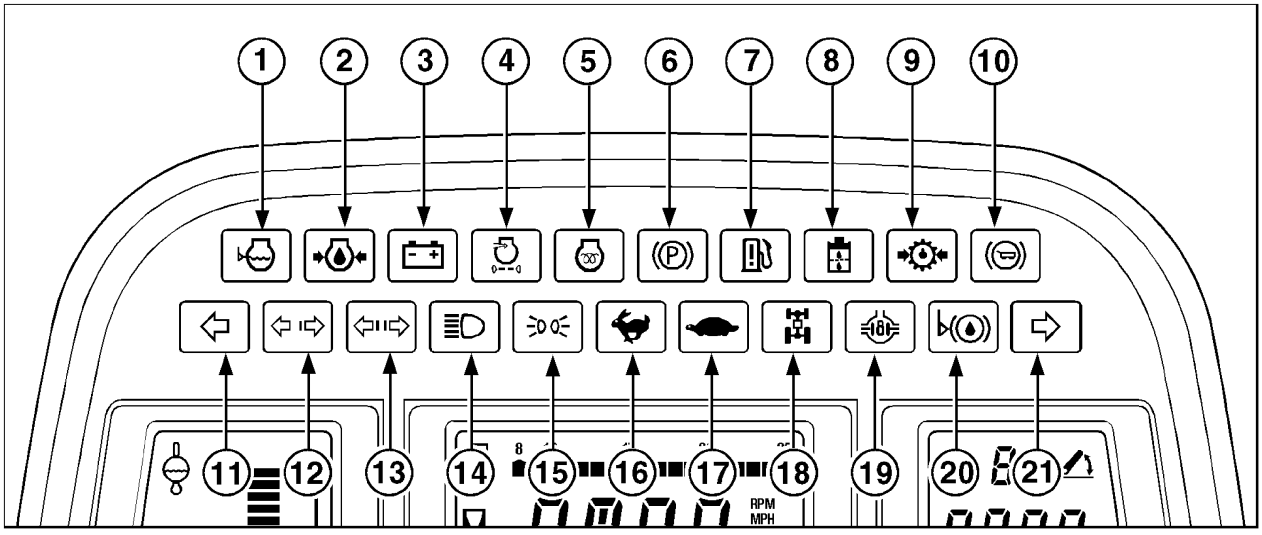
Information provided by the Tractor Performance Monitor is displayed in the right-hand panel (2). The display includes:

- Hitch enabled (Electronic Draft Control only)
- Hitch position (Electronic Draft Control only)
- Hitch disabled (Electronic Draft Control only)
- Area per hour forecaster (acres or hectares)
- Area accumulated (acres or hectares)
- Wheel slip (%) - optional feature
- Hydraulic system diagnostic error codes (Electronic Draft Control only) Consult your authorised dealer.

Some tractor malfunctions are accompanied by an audible warning in addition to a warning light and a flashing error code in the relevant LCD.

When the key-start switch is turned on, a self-test of all the LCD segments is activated, the audible alarm will sound for approximately one second and the lamps that warn of a malfunction will be illuminated briefly, to confirm that the bulbs are functioning. The LCD areas are illuminated when the tractor lights are turned on.

IMPORTANT: *Before carrying out arc welding on the tractor or equipment attached to the tractor, disconnect all power and earth leads to the instrument panel/Performance Monitor in order to avoid possible damage to electronic components.*



71

Indicator and Warning Lights With Audible Alarm – Figure 71

The 21 coloured lights shown, provide operating information or give warning of system malfunction. The malfunction warning lights are accompanied by an audible alarm. Dependent upon the severity of the problem, the alarm will sound as follows:

Non-critical alarm: Continuous alarm for 5 seconds only.

Critical alarm: Intermittent alarm will sound until fault is corrected or engine is switched off. The lights and audio alarm function as follows:

Upper Row – left to right

1. Engine coolant level low – Light will illuminate accompanied by flashing LCD and **critical alarm**. Stop the engine and investigate the cause. See also 'Bargraph Display' on page 2-37 and 'Automatic Engine Shut Down' on page 7-2.

⚠ WARNING ⚠

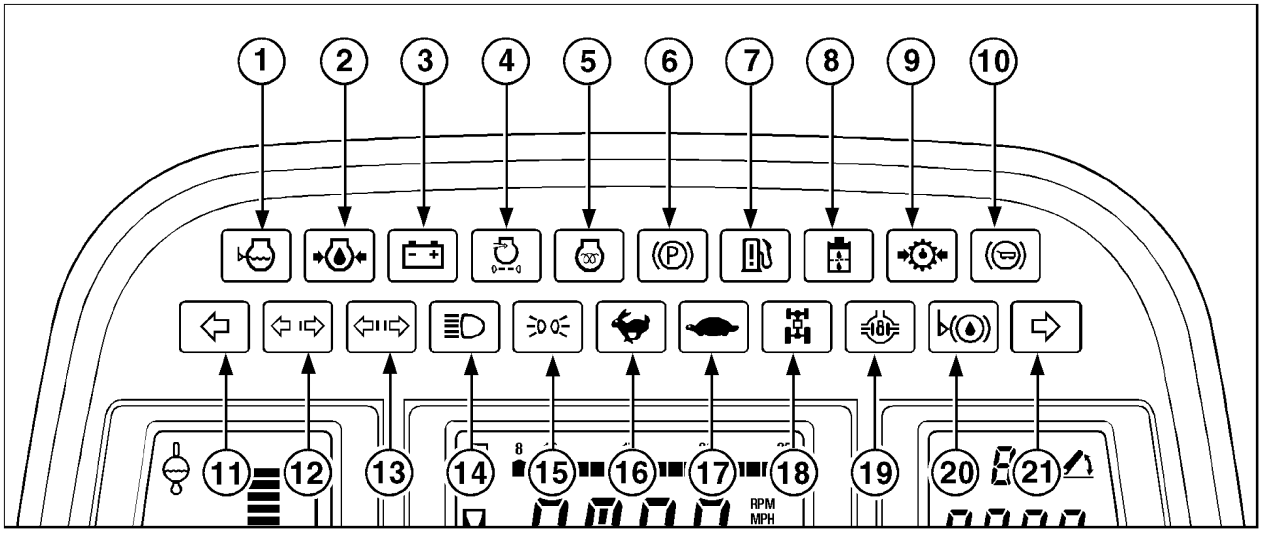
The cooling system operates under pressure which is controlled by the pressure cap on the coolant recovery tank. It is dangerous to remove the cap while the system is hot. When the system has cooled, use a thick cloth and turn the pressure cap slowly to the first stop and allow the pressure to escape before fully removing the cap. Coolant should be kept off the skin. Adhere to the precautions outlined on the antifreeze container.

2. Engine oil pressure low – Light will illuminate accompanied by flashing LCD and **critical alarm**. Stop engine and investigate the cause. See also 'Bargraph Display' on page 2-37 and 'Automatic Engine Shut Down' on page 7-2.

3. Alternator not charging – Light will illuminate if alternator is not charging the battery.

4. Air cleaner – Light will illuminate accompanied by **non-critical alarm**. Stop the tractor and service the air cleaner to prevent engine damage.

5. Thermostart – Light will illuminate when the Thermostart is activated by the key-start switch. See 'Starting the Engine' on page 3-2.



72

Figure 72

6. Parking brake - With the key-start switch on, a flashing light indicates that the parking brake is applied. If any attempt is made to drive the tractor with the parking brake applied or partially applied, the **critical alarm** will sound. Conversely, if the key-start switch is turned off and the parking brake is not applied, the **critical alarm** will sound continuously for a minimum of two minutes or until the handbrake is applied.

⚠ WARNING ⚠

To avoid personal injury, always apply the parking brake before leaving the tractor seat.

7. Water in fuel - Light will illuminate accompanied by **non-critical alarm** if water is detected in the fuel. Stop the tractor and service the fuel filters to prevent damage to the fuel injection system.

8. Transmission oil filter blocked - Light will illuminate accompanied by **non-critical alarm** if transmission oil filter is blocked or partially blocked. Stop the engine and service the oil filter to avoid damage to the transmission.

9. Transmission oil pressure - Steady light accompanied by **critical alarm** indicates that the transmission lubrication circuit oil pressure is low. Stop the engine and investigate the cause.

   Tractors with CCLS pump only - Flashing light accompanied by **non-critical alarm** indicates that the charge pump intake and pressure filters are blocked or partially blocked causing low pump pressure. Service the tractor as soon as practicable and certainly within 1 hour of operation.

10. Trailer brake air pressure - Light will illuminate to indicate that air pressure to the pneumatic trailer brake circuit is low.

10. Trailer brake hydraulic oil pressure (Italy only) - Light will flash accompanied by **critical alarm** to indicate that oil pressure to the hydraulic trailer brake circuit is low. Stop the engine and investigate the cause.

Lower Row - left to right

11. Left turn indicator - Light will flash in unison with tractor left-hand turn signal.

12. Trailer turn signal - Light will flash in unison with tractor/trailer turn signals if trailer attached.

13. Trailer turn signal - Light will flash in unison with tractor/trailer turn signals if second trailer attached.

14. Headlight main beam - Light will illuminate when the tractor lights are switched to main beam.

15. Parking lights - Light will illuminate when the tractor lights are switched on.

16. 'Hi' drive indicator - Light will illuminate to indicate that the transmission is in 'Hi' drive (Dual Command transmission only).

17. 'Lo' drive indicator - Light will illuminate to indicate that the transmission is in 'Lo' drive (Dual Command transmission only).

18. Four wheel drive - Light will illuminate when the drive to the front wheels is engaged.

19. Differential lock - Light will illuminate when the differential lock(s) is/are in the engaged mode. See 'TerraLock Front and Rear Differential Lock' on page 2-101.

20. Brake fluid level - Light will illuminate to indicate that the brake fluid level is low. Stop the engine and investigate the cause.

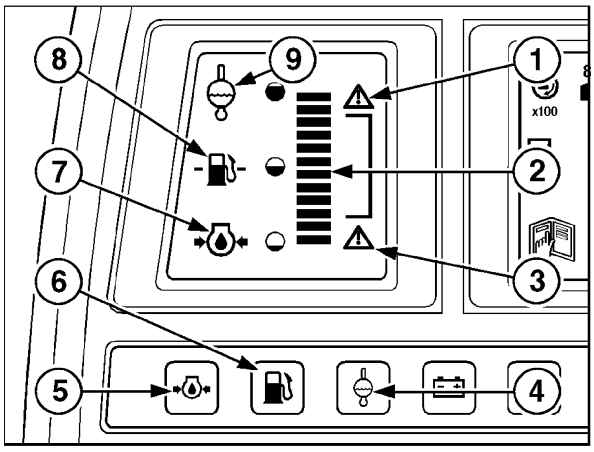
21. Right turn indicator - Light will flash in unison with tractor right-hand turn signal.

Bargraph Display (LCD) - Figure 73

The bargraph consists of twelve LCD segments. By touching the appropriate selector button, one of three different tractor functions may be displayed. All three displays are shown here for reference only.

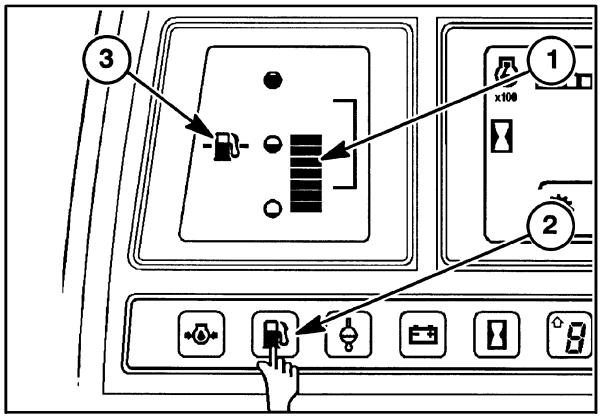
When the key-start switch is turned on the bargraph will automatically display fuel level. When the engine is started the bargraph will automatically change to display engine oil pressure. After 10 minutes of operation it will change again to display engine coolant temperature.

The bargraph may, of course, be made to show any of the other functions by touching the appropriate selector button (4), (5) or (6).



73

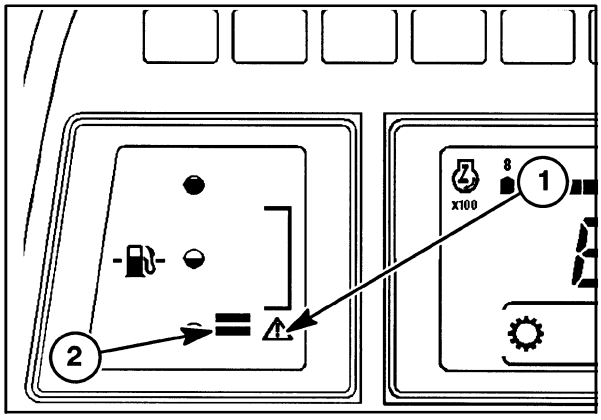
Fuel Level - Figure 74
Touch the button (2) to display fuel level. The symbol (3) will display, to signify that the bargraph display (1) relates to fuel level.



74

Fuel Level - Figure 75
When the fuel level falls such that the bargraph display changes from three to two segments or from two to one segment, the bargraph and the 'low' warning symbol (1) will flash and the **non-critical alarm** will sound for 5 seconds.

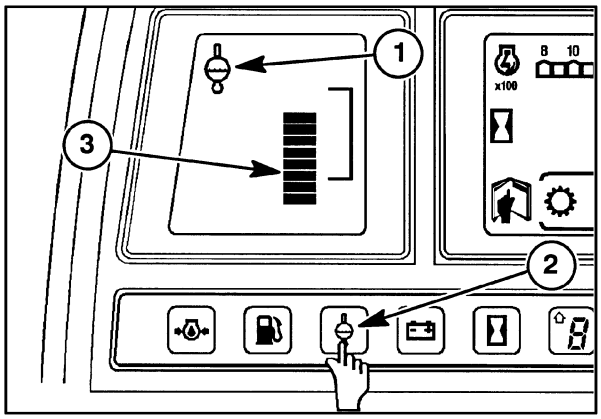
NOTE: *Even if the bargraph is not displaying fuel level, when the content of the fuel tanks falls below the designated level, the bargraph will automatically change to display fuel level, the displays will flash and the alarm will be activated, as described above.*



75

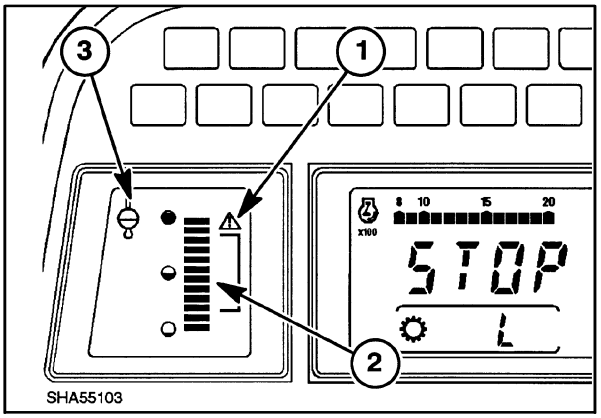
Engine Coolant Temperature - Figure 76
Touch the button (2) to display engine coolant temperature. The symbol (1) will display to signify that the bargraph (3) relates to coolant temperature. One segment of the bargraph will be displayed if the engine is cold. The number of segments displayed will increase as the engine warms up. With the engine at normal operating temperature, up to ten segments will be displayed.

NOTE: *The bargraph indicates engine coolant temperature only. It is not an indication of coolant level. The engine coolant level must still be checked daily.*



76

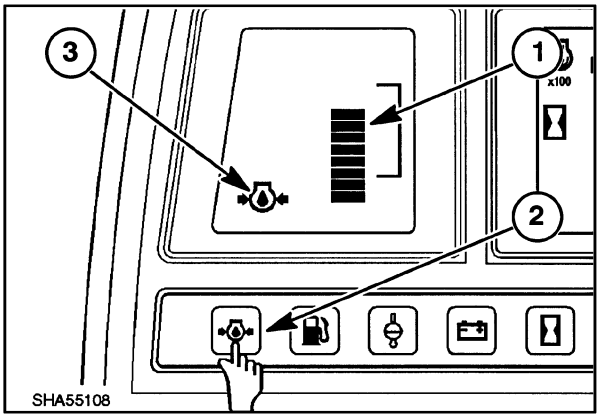
Figure 77
Should the coolant temperature exceed a pre-determined level, the 'high' warning symbol (1), the bargraph (2) and the coolant symbol (3) will flash. The **critical alarm** will sound, the word STOP will flash in the central display and the Tractor Performance Monitor display will become blank. Stop the engine immediately and investigate the cause. See also 'Automatic Engine Shut Down' on page 7-2.



77

Engine Oil Pressure - Figure 78
Touch the button (2) to display engine oil pressure. The symbol (3) will display to signify that the bargraph (1) relates to engine oil pressure. With normal engine oil pressure, up to ten segments of the bargraph will be displayed.

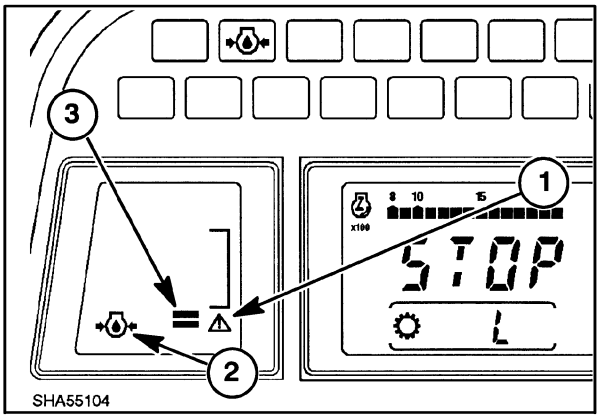
NOTE: *The bargraph indicates engine oil pressure only. It is not an indication of oil level. The engine oil level must still be checked daily by means of the dipstick.*



78

Figure 79
Should engine oil pressure fall below a designated level, the 'low' warning symbol (1), the oil pressure symbol (2) and the bargraph (3) will flash. The **critical alarm** will sound, the word STOP will flash in the central display and the Tractor Performance Monitor display will become blank. Stop the engine immediately and investigate the cause. See also 'Automatic Engine Shut Down' on page 7-2.

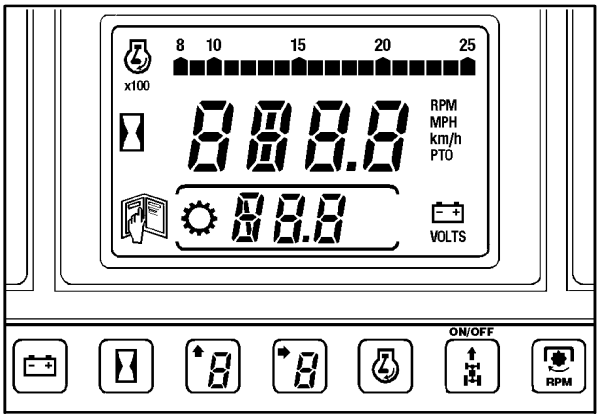
NOTE: *If both coolant and oil pressure alarms are activated together, the coolant and oil pressure symbols, the high and low symbols and all 12 segments of the bargraph will flash.*



79

Central Display (LCD) - Figure 80

The central display area contains several digital displays with a bargraph above. The bargraph provides a constant read-out of engine rev/min.



80

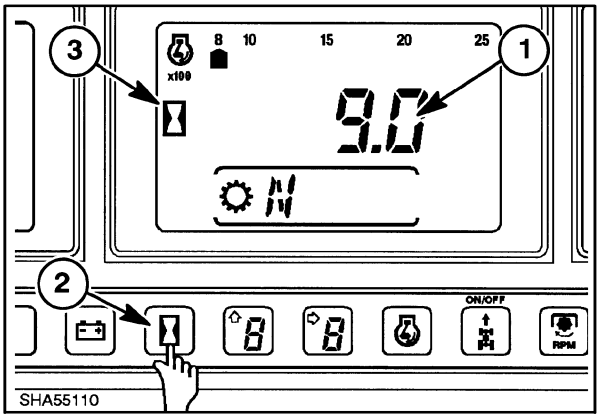
The digital displays that may be selected are:

- Engine hours operated (actual time)
- Engine speed (rev/min)
- Tractor ground speed (MPH or Km/h)
- P.T.O. speed (rev/min)
- Battery condition (volts)
- Gear ratio selected (Dual Command transmission only)

The complete display is shown here, for reference only.

Engine Hourmeter - Figure 81

When the key-start switch is turned on, the hourmeter symbol (3) will display and the hours the engine has operated will appear in the main LCD (1). Manual selection of another function or starting up the engine will cause the display to change. The hourmeter display may be recalled at any time by touching the button (2).



81

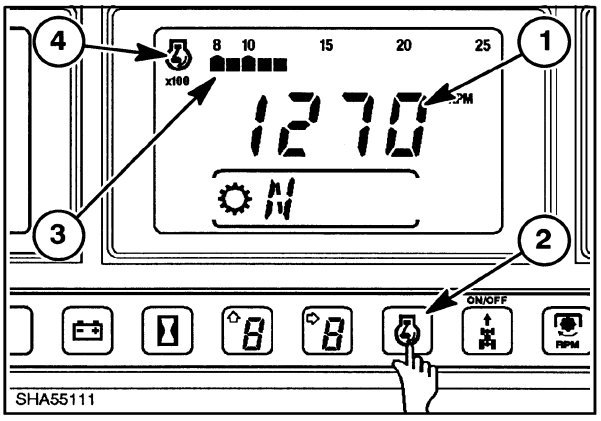
With the engine running, the hourmeter will accumulate hours in increments of 0.1 hours until 1000 hours is reached. After that time, the hourmeter will accumulate complete hours only, e.g. 1001, 1002 hours, etc.

NOTE: *Accumulated hours are stored in the computer permanent memory which is not affected by disconnection of the tractor battery.*

The hourmeter may be programmed to remind the operator when the next scheduled service is due. See 'PROGRAMMING THE MAIN DISPLAY' on page 2-43.

Engine Speed - Figure 82
With the engine running, the engine speed symbol (4) and bargraph (3) will be constantly displayed. Each segment of the 18 segment bargraph represents 100 rev/min and indicates engine speeds between 800 and 2500 rev/min.

With the engine running, touch button (2) and the 'RPM' legend will display together with a digital display of engine rev/min in the main LCD (1).

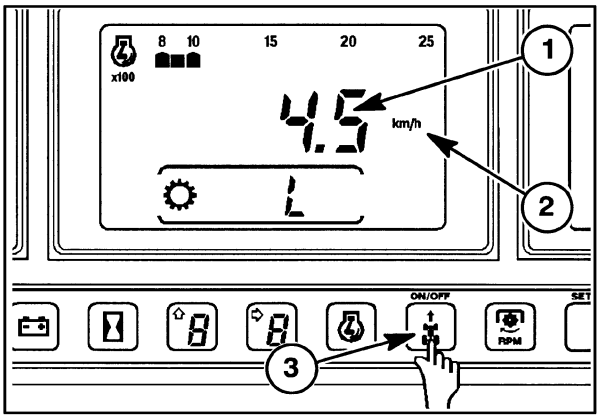


82

Ground Speed Display (Speedometer) - Figure 83
NOTE: *The display is set in the factory to show MPH or km/h, dependent upon destination. If required, the display may be changed to show the alternate units, See Figures 105,106 on page 52.*

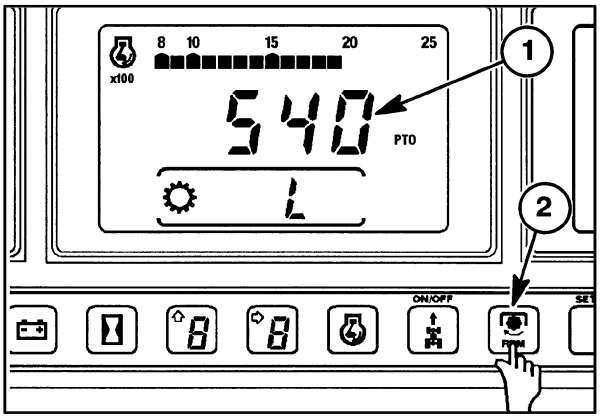
Touch button (3) to show the ground speed (1) in MPH or km/h. The 'MPH' or 'km/h' legend (2), as appropriate, will also be displayed. The picture shows the display in km/h.

NOTE: *The central display will automatically show ground speed if the tractor is travelling at more than 12.4 MPH (20 km/h). If it is required to display any other function, the appropriate selector button must be depressed. Diagnostic error codes (tractor circuits and transmission) will display automatically if a malfunction occurs. Consult your authorised dealer.*



83

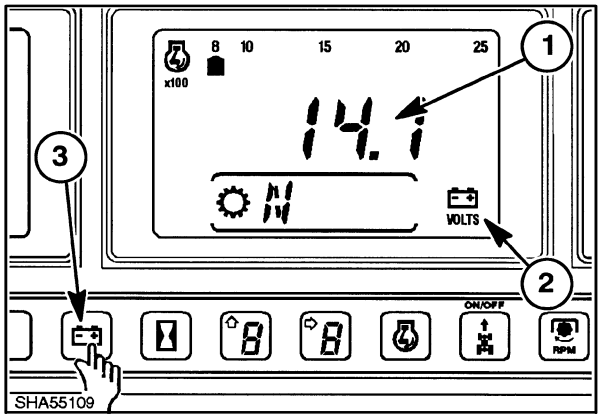
Power Take Off Display - Figure 84
Touch button (2) and the 'PTO' legend will display, together with the P.T.O. speed in the main LCD (1).



84

Battery Voltage - Figure 85

With the engine running, touch selector button (3) to display the battery symbol (2) together with a digital display of battery voltage in the main LCD (1). Should the battery voltage fall below 10.0 volts or rise above 16.0 volts, the 5 second audio alarm will sound. During this period, the battery symbol will flash then remain steady.



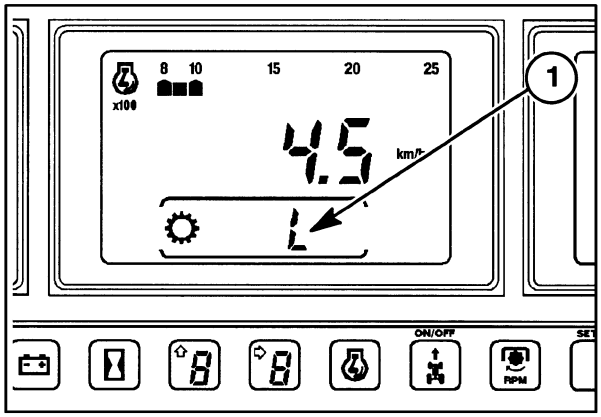
85

If another function is displayed and the battery voltage goes outside the pre-set limits, the display will automatically change to show the voltage and the alarm will sound, as previously described. If the display is manually changed to show another function while the battery voltage is outside the set limits, the battery symbol will continue to flash until the malfunction is corrected.

Transmission Gear Ratio Display (Dual Command transmission only) - Figure 86

The lower LCD (1) provides a permanent display of the gear ratio selected, provided the key-start switch is on.

NOTE: *If your tractor is equipped with Range Command transmission then the selected gear ratio is displayed in a LCD adjacent to the gear shift lever.*



86

PROGRAMMING THE MAIN DISPLAY

There are two functions that may be programmed into the computer module by the operator:

1. **Next service due reminder**

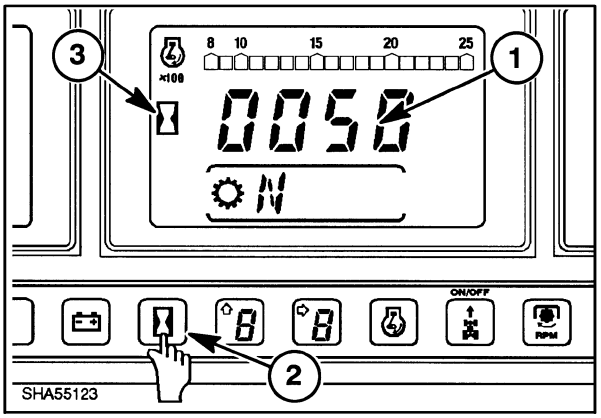
2. **Ground speed calibration**

1. Programming the 'Next Service Due' reminder - Figure 87

Example: Next service due reminder required at, say, 300 hour intervals.

With the key-start switch on but with the engine stationary, the hourmeter (3) will be displayed. Press and hold down button (2) for approximately three seconds until a 'beep' from the audio alarm indicates that the computer is in the programming mode.

A number in the display (1) corresponds to the 'next service due' interval previously entered into the memory. If '0000' is programmed into the display the 'next service due' reminder will be cancelled.

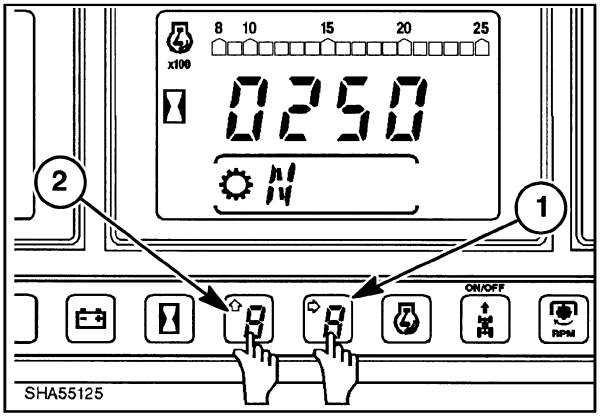


87

Figure 88

The left-hand digit of the display will be flashing. If the digit is already reading '0' there is no need to change it. Touch the DIGIT SELECT button (1) to select the next digit to the right, which will flash.

Each touch of the DIGIT SET button (2) will increase the value of the flashing digit by one. When the digit reaches '3', touch the DIGIT SELECT button (1) which will cause the next digit in the display to flash.

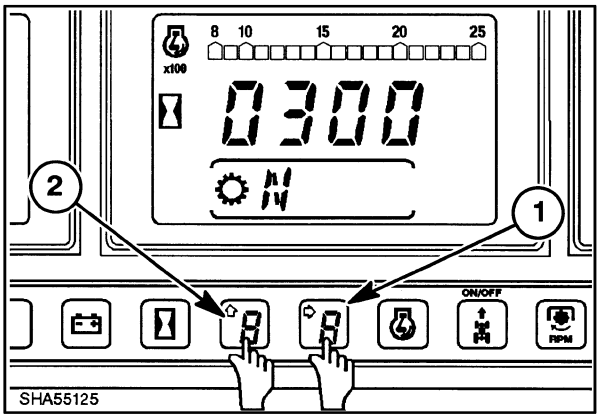


88

Figure 89

Change the value of this digit, if necessary, using the DIGIT SET button (2), as previously described, until it reaches '0'. Again, touch the DIGIT SELECT button (1) which will cause the next digit in the display to flash and change the value of this digit using the DIGIT SET button (2).

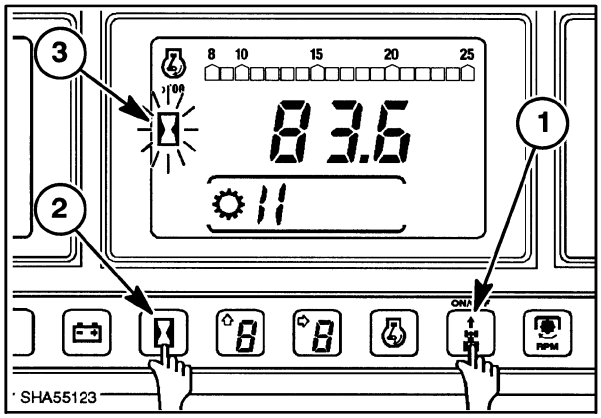
With '0300' displayed, enter the display into the memory by turning the key-start switch off.



89

Figure 90

Every 300 hours of tractor operation (300, 600, 900 hours, etc.), the hourmeter symbol (3) will flash whenever the hourmeter is displayed. The display will continue to flash for 10 operating hours or until it is cancelled by touching buttons (1) and (2) simultaneously.

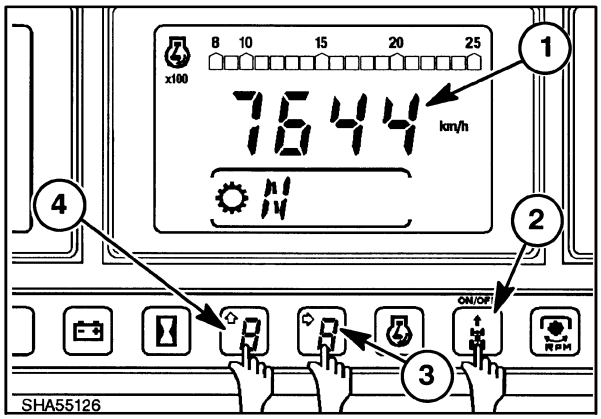


90

2. Ground Speed Calibration - Figure 91

The ground speed in the display is calibrated in the factory to suit the rolling radius of the rear tyres. However, should tyres of a different size be fitted, then the computer module may be recalibrated to display a more accurate ground speed using the following method:

IMPORTANT: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed, as sensed by a radar unit. Calibration is* ***not*** *required, the calibration number being a constant '4018'.*



91

⚠ WARNING ⚠

The radar ground speed sensor emits a low intensity microwave signal which will not cause any ill effects in normal use. Although the signal intensity is low, do ***not*** *look directly into the face of the sensor while in operation so as to avoid eye damage. The radar sensor is beneath the front of the footsteps on the right-hand side.*

- Using the table below, according to transmission type, note the calibration number that corresponds to your tractor model, transmission type and tyre size.

Figure 91

- Turn the key-start switch on and hold down button (2) for 3 seconds. A 'beep' from the audio alarm indicates that the computer is in the programming mode and the previously entered calibration number (1) will be displayed with the left-hand digit flashing.
- If required, change the value of the flashing digit using the DIGIT SET button (4), as described previously in programming the 'Next Service Due' reminder.
- To select the next digit to the right, use the DIGIT SELECT button (3) and when that digit is flashing use the DIGIT SET button (4) to change the value. Repeat for remaining digits, turn off key-start switch to store settings.

GROUND SPEED CALIBRATION NUMBERS

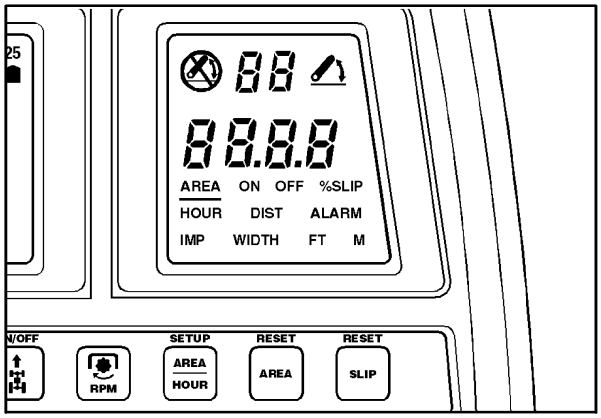
NOTE: *If your tractor is equipped with the optional slip control feature, then the ground speed displayed is a true speed, as sensed by the radar unit. Calibration is not required, the calibration number being a constant '4018'.*

MODEL	TM 115 & TM125	TM135 & TM150	TM165	
REAR TYRE SIZE	ALL TRANSMISSIONS	ALL TRANSMISSIONS	RANGE COMMAND	POWER COMMAND
18.4 x 34	7643	n/a	n/a	n/a
16.9 x 38	7403	7712	n/a	n/a
480/70R38	7403	n/a	n/a	n/a
18.4 x 38	7177	7476	8716	7923
520/70R38	7177	7476	8716	7923
600/65R38	7177	7476	8716	7923
20.8 x 38	n/a	7170	8359	7599
580/70R38	n/a	7170	8359	7599
650/65R38	n/a	7170	8359	7599
18.4 x 42	n/a	7047	8215	7468
14.9 x 46	6804	7088	8262	7511
12.4 x 54	6397	6664	7768	7062
320/90R54	6397	6664	7768	7062

TRACTOR PERFORMANCE MONITOR

Figure 92

The Tractor Performance Monitor (TPM) is displayed in the right-hand side of the instrument panel. The TPM is shown here, with all the displays activated, for demonstration purposes. The display includes:



92

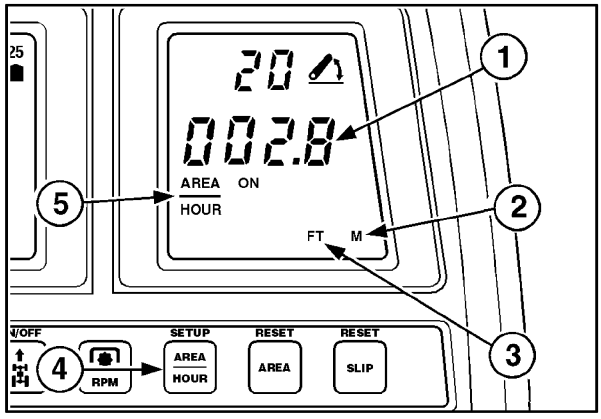
- Area per hour forecaster (acres or hectares)
- Area accumulated (acres or hectares)
- Hitch enabled (with Electronic Draft Control only)
- Wheel slip (%) - with radar option
- Hitch position (with Electronic Draft Control only)
- Hitch disabled (with Electronic Draft Control only)
- Hydraulic system diagnostic error codes (with Electronic Draft Control only - will display automatically if a malfunction occurs)

IMPORTANT: *Before carrying out arc welding on the tractor or equipment attached to the tractor, disconnect all power and earth leads to the instrument panel/Performance Monitor in order to avoid possible damage to electronic components.*

Area per Hour Forecaster - Figure 93

Touch the AREA/HOUR button (4). The 'AREA/HOUR' legend (5) will display, together with a forecast (1) of the area that will be worked in one hour if the current rate of work is continued. '0' will be displayed whenever the implement is raised.

When in the metric mode, denoted by 'M' (2),The forecast will be in hectares. In the Imperial mode, denoted by 'FT' (3) the forecast will be in acres. See 'PROGRAMMING THE TRACTOR PERFORMANCE MONITOR' on page 2-49.



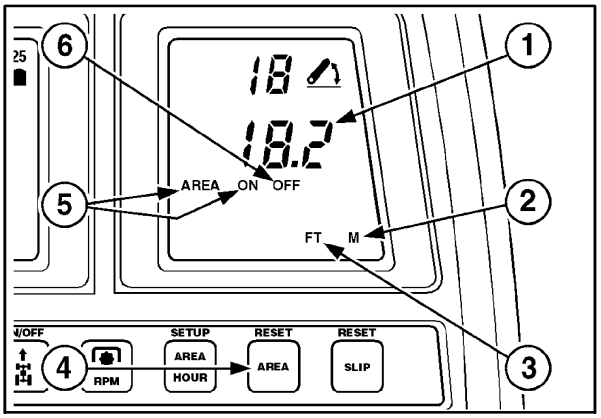
93

NOTE: *If radar is not installed, area per hour calculations are based on axle speed and are subject to inaccuracies caused by the wheel slip that may be present.*

Area Accumulator - Figure 94

Accumulated area (1) (total area worked) can be displayed by depressing the AREA button (4). The 'AREA' and 'ON' legends (5) will display.

When in the metric mode, denoted by 'M' (2), the accumulated area will be displayed in hectares. In the Imperial mode, denoted by 'FT' (3) the area will be in acres. See 'PROGRAMMING THE TRACTOR PERFORMANCE MONITOR' on page 2-49.



94

Touch the 'AREA' button again and the word 'OFF' (6) will display and 'ON' will disappear.

Area accumulation will switch on and off automatically as the implement is lowered and raised. If required, area counting may be switched on and off manually by connecting a switch into the implement status socket on the accessory power panel. See page 2-14.

In the metric mode, the display (1) starts to accumulate in increments of .01 hectares. When 100.0 hectares is reached, area accumulation continues in increments of 0.1 hectares until 1000 is reached. The display will then accumulate whole hectares. When 9999 hectares is reached, the display will reset to zero.

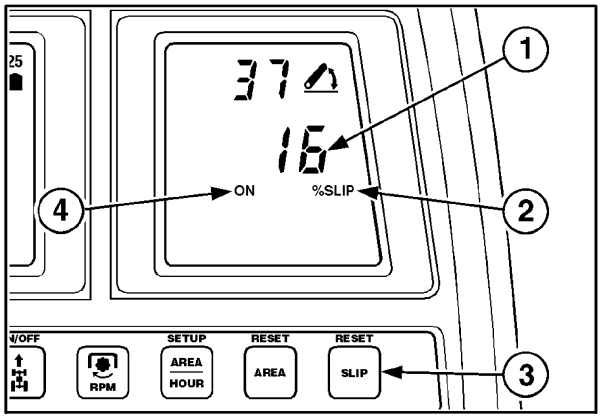
Imperial display starts to accumulate in increments of 0.1 acres. When 1000 acres is reached, area accumulation continues in whole acres. When 9999 acres is reached, the display will reset to zero.

Area accumulation can be reset to zero at any time by holding down the AREA button (4) until a 'beep' is heard from the alarm (approximately 3 seconds).

NOTE: *If the radar option is not installed, area calculations are based on axle speed and are subject to inaccuracies caused by the wheel slip that may be present.*

Wheel Slip (with radar option) - Figure 95

Touch the SLIP selector button (3). The '% SLIP' legend (2) and 'ON' (4) will display together with a two-digit value (1) in the main TPM display. This slip value is detected by the comparison of theoretical ground speed (axle rotation sensor) with true ground speed (radar sensor).



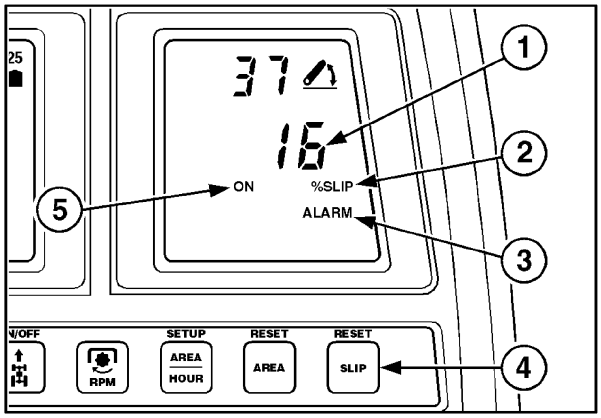
95

Slip calibration occurs automatically. However, when widely differing soil conditions are encountered it may be necessary to manually recalibrate the wheel slip ratio, as follows:

Drive the tractor in the soil conditions to be worked, with implement raised, at a constant speed of less than 10 MPH (16 km/h). This will determine the minimum wheel slip, under light operating conditions, that is to be used as a reference point. Hold down the SLIP button (3) for at least 3 seconds. A 'beep' from the alarm and '0' in the display (1) indicates that the computer has been calibrated to a minimum slip condition.

Slip Alarm (with radar option) - Figure 96

A slip alarm point may be entered to advise the operator when wheel slip exceeds the desired amount. See 'PROGRAMMING THE TRACTOR PERFORMANCE MONITOR'. When wheel slip exceeds the value entered, the alarm will sound for 5 seconds. If wheel slip is selected, the '% SLIP' legend (2) will be displayed as normal. In addition, the 'ALARM' legend (3) will flash and continue to flash until wheel slip is reduced to below the preset level.



96

If wheel slip is not being displayed, both the '% SLIP' legend (2) and 'ALARM' legend (3) will flash until the slip condition is restored to below the preset level.

Hitch Enabled Symbol (with Electronic Draft Control only) - Figure 97

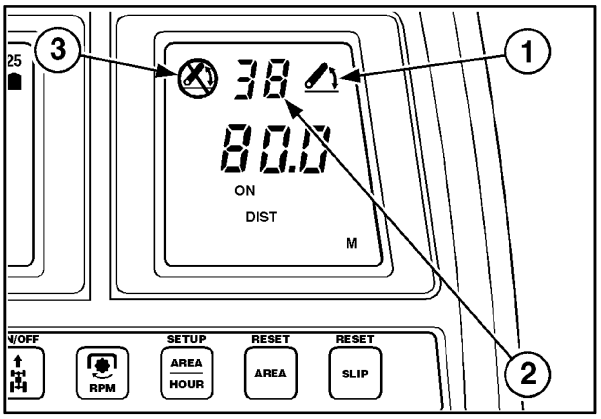
The hitch enabled symbol (1) is displayed to advise the operator when the 3-point linkage is in phase with the hydraulic lift control lever. See 'ELECTRONIC DRAFT CONTROL' on page 3-45.

Hitch Position Display (with Electronic Draft Control only) - Figure 97

The display (2) advises the operator of the position of the lower links (and implement) by means of numbers ranging from '0' (fully lowered position) to '99' (maximum lift height). See 'ELECTRONIC DRAFT CONTROL' on page 3-45.

Hitch Disabled Symbol (with Electronic Draft Control only) - Figure 97

The hitch disabled symbol (3) is displayed when the 3-point linkage is out of phase with the hydraulic lift control lever. See 'ELECTRONIC DRAFT CONTROL' on page 3-45.



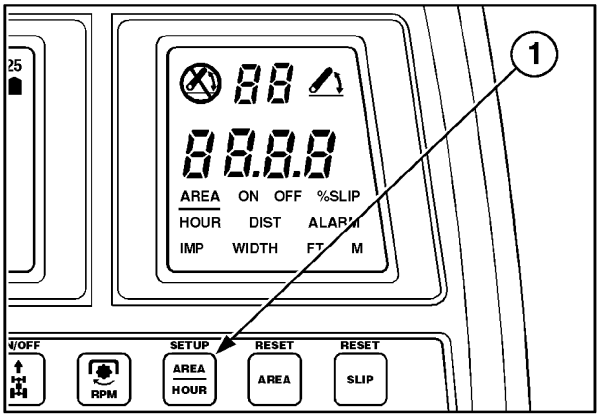
97

PROGRAMMING THE TRACTOR PERFORMANCE MONITOR

Figure 98

In order that the computer may correctly calculate work done (area per hour, area accumulated, etc.) various factors must be entered into the computer in order that work done may be correctly displayed. To enter the TPM set up mode, turn the key-start switch on and hold down the SET UP button (1) until a 'beep' is heard from the alarm (approximately 3 seconds).

When in the set up mode, repeatedly touching the SET UP button (1) will cause the computer to run through the five set up functions in the order shown below. As each set up function is selected, the appropriate legend will be displayed in the lower part of the LCD.



98

Function	Legend displayed
1. Implement width	IMP WIDTH
2. Slip alarm point (option)	% SLIP ALARM
3. Area preset	AREA
4. Distance measurement	ON DIST
5. Imperial/metric units selection	FT or M

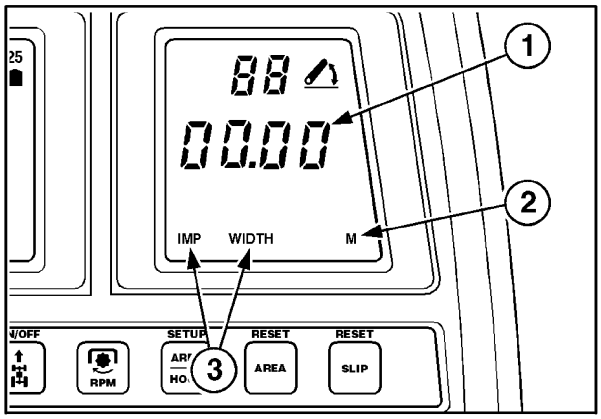
Touching the SET UP button again will repeat the above sequence. Alternatively, to exit the set up mode, turn the key-start switch off.

Set the functions in the following order:

Setting Implement Width - Figure 99

In order that the computer may calculate the work done, the working width of the implement in use must be entered into the memory.

Implement width is a four-digit display and will appear as '00.00' metres (1) or '000.0' feet with the left-hand digit flashing. 'IMP WIDTH' (3) will also be displayed and either 'M' (2) or 'FT' to indicate metric or Imperial measure.

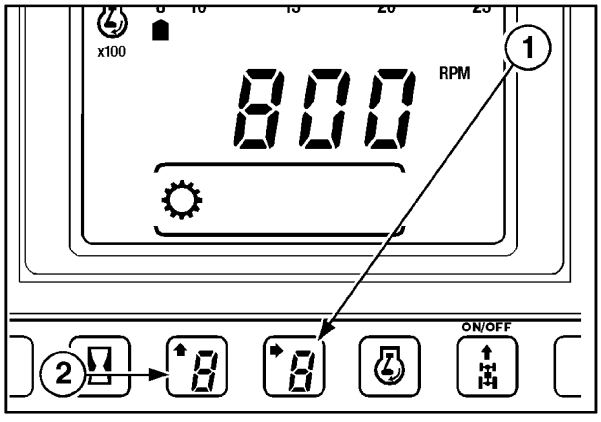


99

Figure 100

To set an implement working width of, say, 12.5 feet, a display of '012.5' is required. Touch the DIGIT SELECT button (1) to cause the second digit from the left to flash. Touch the DIGIT SET button (2) to change the flashing digit from '0' to '1'. Use the DIGIT SELECT and DIGIT SET buttons to change the remaining digits until '012.5' is displayed.

NOTE: *The area measured will only be accurate if there is no implement overlap when the tractor turns around at the end of a run to make another pass. Alternatively, the implement width entered into the computer memory may be reduced by the estimated amount of overlap.*



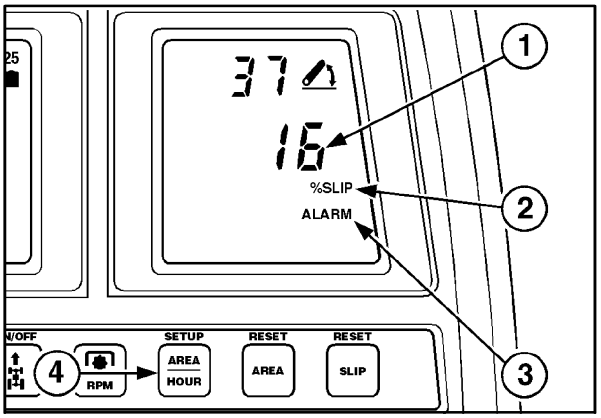
100

With the required implement width displayed, touch the SET UP button to enter the memory and change the display to the slip alarm point.

Setting the Slip Alarm Point (option) - Figure 101

NOTE: *If the optional radar unit is not installed, the slip alarm function will be omitted from the sequence.*

The slip alarm point will appear as a two-digit display (1) with the left-hand digit flashing. '% SLIP' (2) and 'ALARM' (3) will also be displayed.

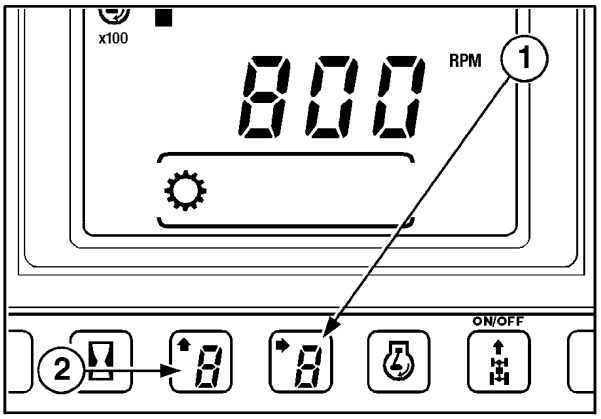


101

Figure 102

Use the DIGIT SELECT and DIGIT SET buttons (1) and (2) to change the value to the required setting. If the slip alarm is not required, set the display to '00'.

With the required slip alarm point displayed, touch the SET UP button (4) Figure 101, to enter the alarm point into the memory and change the display to show area preset.



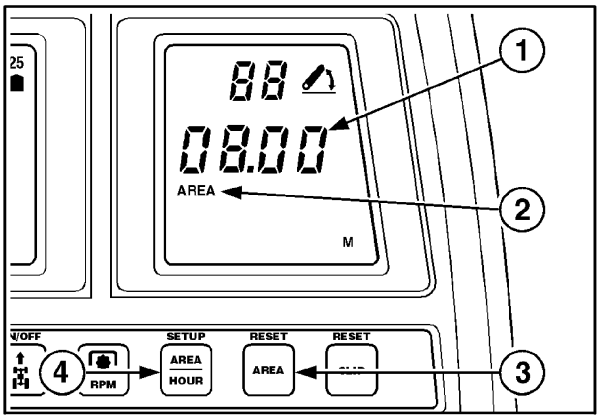
102

Area Preset - Figure 103

Normally, area would be reset to zero by holding the AREA button (3) Figure 103, down until a 'beep' is heard from the alarm (approximately 3 seconds). However, it is possible to enter a value other than zero and so measure additional area worked. Area measured during a previous operation can be entered or an estimate of implement overlap can be entered at the start of a job.

The area preset will appear as a four-digit display (1) with the left-hand digit flashing. 'AREA' (2) will also be displayed in the LCD. Use the DIGIT SET and DIGIT SELECT buttons, as previously described, to change the value to the required setting or to zero.

Touch the SET UP button (4) to enter the memory and change the display to show distance accumulation.



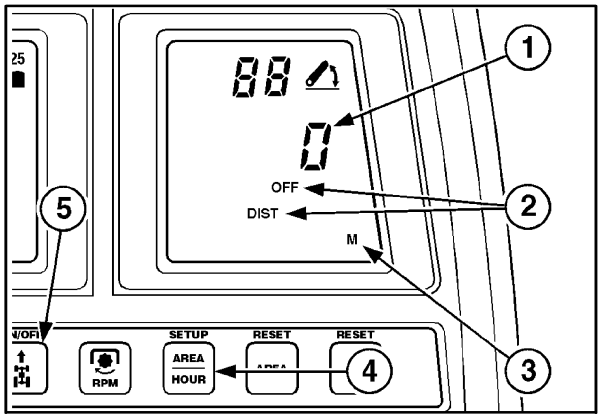
103

Distance Measuring Mode - Figure 104

When entering this mode, the display will show 'DIST OFF' (2) and either 'FT' or 'M' (3), depending upon whether Imperial or metric measure had previously been selected. '0' will also appear in the display (1).

To start distance measurement, touch the ON/OFF button (5). The display will show a constantly changing distance travelled while the tractor is moving. To stop distance measurement, touch the ON/OFF button again.

Touch the SET UP button (4) to enter the memory and change the display to show Imperial/metric units selection.



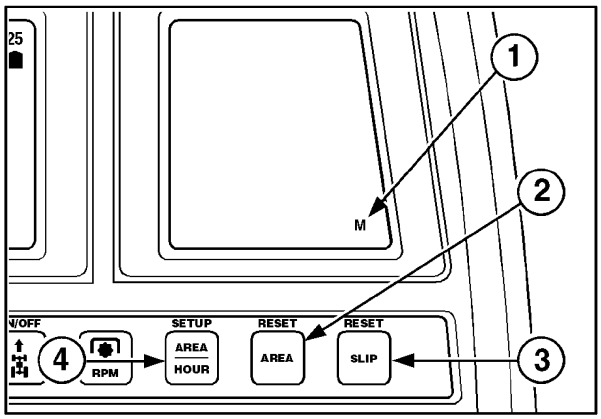
104

Setting Metric/Imperial Units - Figure 105 and 106

The TPM digital display will be blank with either FT or M (1) Figure 105, flashing and the corresponding ground speed units km/h (1) Figure 106 or MPH flashing in the central display.

If the metric measure legends 'M' (metres) and 'km/h' are flashing but Imperial measure 'FT' (feet) and 'MPH' are required, touch either of the RESET buttons (2) or (3) Figure 105, to change the display. Touch either of the RESET buttons again to revert to Metric measure.

With the required measure displayed (Imperial or metric), touch the SET UP button (4) Figure 105, to enter the memory and change the display to implement width set up.

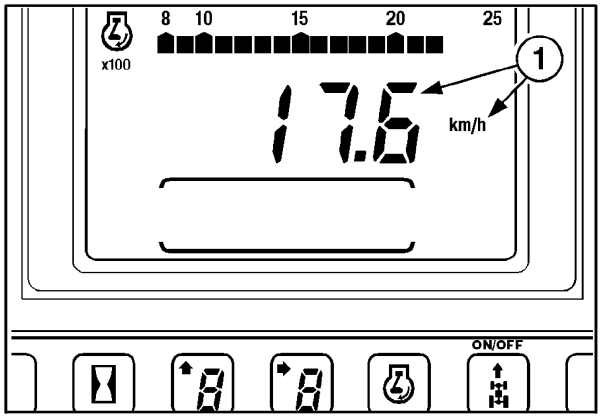


105

Exiting the Set Up Mode - Figure 105

To exit the set up mode, press and hold the SET UP button (4) for 3 seconds when a 'beep' from the audio alarm will be heard and the display will go to the AREA/Hour mode. Alternatively, to exit the set up mode, turn the key-start switch off.

The Tractor Performance Monitor is now programmed for use.



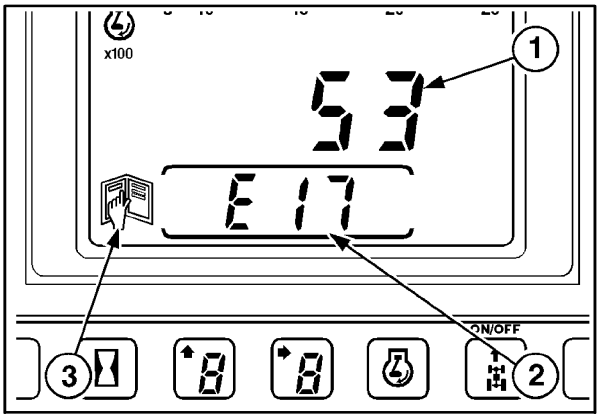
106

Malfunction Warning Symbols - Figure 107

In the unlikely event that a fault occurs in the instrument panel or electronic transmission electrical circuits (Dual Command transmission only), the malfunction warning symbol (3), will flash and a fault code will appear in the display. Consult your authorised dealer.

The code will be a simple one- or two-digit number. Instrument panel and Electronic Management Unit (EMU) fault codes will appear in the main display (1), transmission fault codes (Dual Command transmission only) in the lower LCD (2). Transmission fault codes will be preceded by the letter 'E', as shown.

The code indicates the tractor circuit or sensor in which the fault lies and the type of fault, e.g. short circuit, open circuit, sensor failure, etc. In this event, the tractor will require the attention of your dealer.

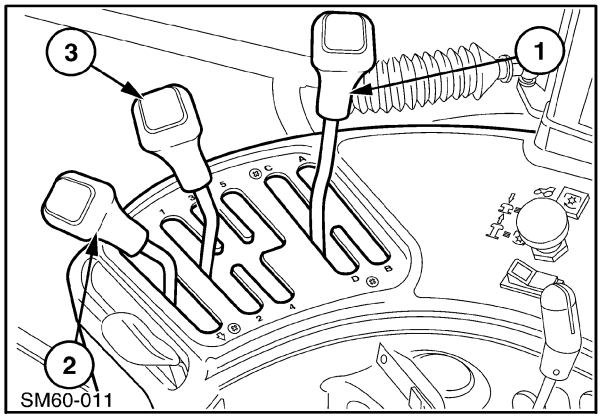


107

16 x 16 and 20 x 16 SYNCHRO COMMAND™ TRANSMISSION (TM115 & TM125 only)

All gear levers, as well as the throttle controls, are colour-coded orange.

This fully synchromesh transmission offers 16 or 20 forward gear ratios and 16 reverse ratios. The optional creeper gears will double the number of available gear ratios, both forward and reverse. Details of creeper gear operation will be found on page 2-56.



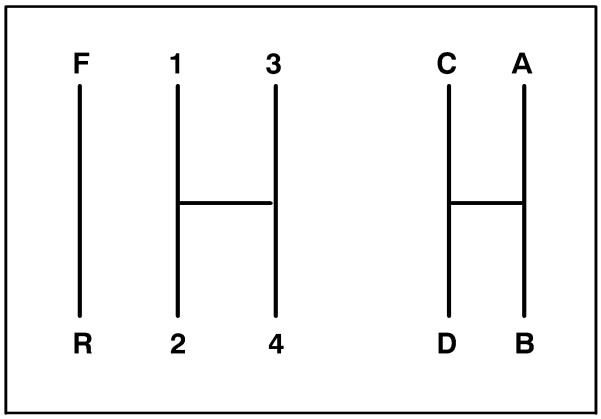
108

Figure 108

Operation is by means of the main shift lever (3) the range lever (1) and the shuttle lever (2), in conjunction with the clutch pedal.

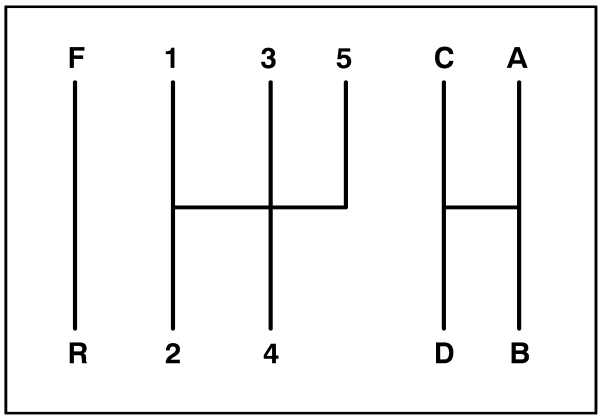
Main Shift Lever - Figures 109 and 110

The main shift lever, in conjunction with the clutch pedal, is used to select any of four or five gear ratios, whether the tractor is stationary or moving. See Figure 109 (16 x 16) or Figure 110 (20 x 16) for gear shift pattern.



109

NOTE: *30 kph transmissions have four gear ratios. 40 kph transmissions have five. When 5th. gear is selected, reverse gear is not obtainable.*



110

Range Lever - Figures 109 and 110

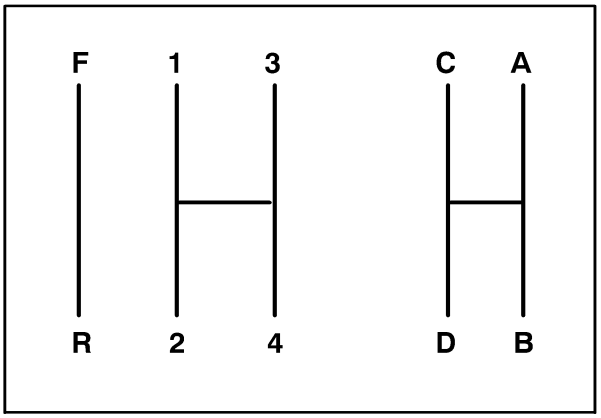
The right-hand lever is the range lever which, in conjunction with the clutch pedal, is used to select any one of four ranges (A - the lowest speed range, B, C and D - the highest speed range). Thus, 40 kph transmission has 20 forward gear ratios, 30 kph transmission has 16. Both transmissions have 16 reverse gears. The design of the transmission permits easy gear changes within a range, including reverse, while the tractor is moving. Stop the tractor to change from one range to another.

Shuttle Lever - Figures 111 and 112

The shuttle (left-hand) lever is used to select forward or reverse travel when any one of the gear ratios is engaged, provided that the clutch pedal is depressed. To reverse the direction of travel, reduce engine speed to a minimum, stop the tractor, depress the clutch and move it rearwards.

⚠ WARNING ⚠

To prevent inadvertent tractor movement, take care to avoid accidental contact with the gearshift levers. Always stop the engine, firmly apply the parking brake and place all gear shift levers in neutral before leaving the tractor.

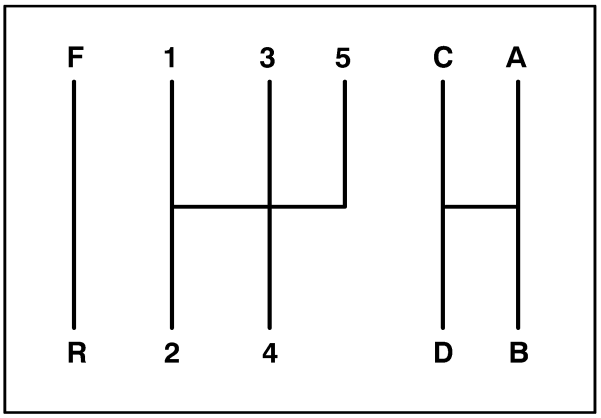


111

NOTE: *When operating in temperatures below -18° C (0° F) with cold transmission oil, avoid shuttle operations, as far as practicable, until the oil has warmed up.*

IMPORTANT: *Fully depress the clutch pedal when changing gear. Partially depressing the clutch pedal when changing gear may result in damage to transmission components. To avoid premature wear, do not use the clutch pedal as a footrest.*

IMPORTANT: *If it is necessary to tow the tractor, all* ***gear levers must*** *be moved to the* ***neutral position before*** *stopping the engine otherwise damage to transmission components may occur during towing. If creeper gears (reduction gear set) are fitted, then the selector lever must be in the* ***off*** *position.*



112

CREEPER GEARS (where fitted)

For operations requiring extra low ground speeds, a reduction gear set (creeper gears) is/are available. The reduction gear set is installed within the main transmission housing and has a reduction ratio of 6:1.

Creeper gears will double the number of available ratios as follows:

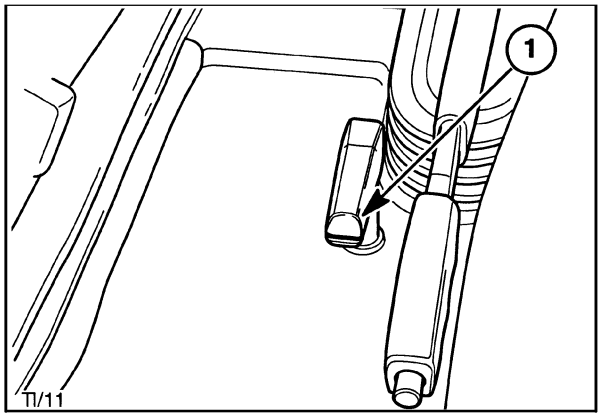
40 km/h - 40 forward and 32 reverse ratios

30 km/h - 32 forward and 32 reverse ratios.

Creeper gear selection - Figure 113

To select the creeper gears, with the engine running and the tractor stationary, engage the required ratio/range. See previous text. Pull the creeper gears selector (1) up to engage the creeper range. Push down to exit the creeper gear mode.

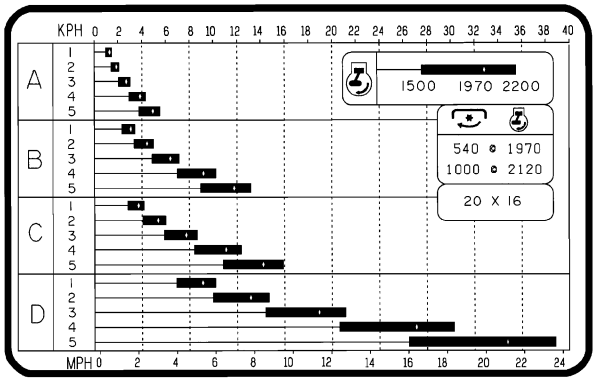
IMPORTANT: *Creeper gears offer very low ground speeds. Do* ***not*** *use the low gearing advantage to apply excessive draft loads to the tractor. Do* ***not*** *use creeper gears in the high range for operations requiring full engine power.*



113

GROUND SPEED DECALS - Figure 114

A decal similar to that shown here is affixed to the lower, front corner of the right-hand window. The decal illustrates the approximate ground speed in all ratios at three alternative engine speeds.



114

The left edge of each block represents an engine speed of 1500 rev/min. and the right-hand edge rated speed (2200 rev/min). A white dot in the centre of each block depicts the engine speed at which the 540 rev/min. P.T.O. speed of is obtained (1970 rev.min).

To find the ground speed at 1970 engine rev/min. in 4th. gear range C, follow the white dot on the C4 block, up to the KPH line or down to the MPH line. In the example shown, the ground speed indicated is 11 kph or 6.8 MPH.

Ground Speed Charts

The charts on the following pages show the ground speeds in km/h and MPH. To find the road speed for your tractor in any given gear ratio, use the column with your rear tyre size in the heading.

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h 16 x 16 Transmission

Gear Ratio	Shift Lever Positions: Range lever	Shift Lever Positions: Main lever	Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios								
F1	A	1	1.4	(0.9)	1.4	(0.9)	1.5	(0.9)
F2	A	2	2.0	(1.2)	2.1	(1.3)	2.1	(1.3)
F3	A	3	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F4	A	4	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)
F5	B	1	3.3	(2.0)	3.4	(2.1)	3.5	(2.2)
F6	B	2	4.7	(3.0)	4.9	(3.0)	5.0	(3.1)
F7	B	3	6.8	(4.2)	7.0	(4.4)	7.2	(4.5)
F8	B	4	9.8	(6.1)	10.1	(6.3)	10.3	(6.4)
F9	C	1	4.0	(2.5)	4.1	(2.5)	4.2	(2.6)
F10	C	2	5.7	(3.6)	5.9	(3.7)	6.0	(3.7)
F11	C	3	8.2	(5.1)	8.5	(5.3)	8.7	(5.4)
F12	C	4	11.8	(7.3)	12.2	(7.6)	12.4	(7.7)
F13	D	1	9.7	(6.0)	10.0	(6.2)	10.2	(6.3)
F14	D	2	14.0	(8.7)	14.4	(9.0)	14.7	(9.1)
F15	D	3	20.1	(12.5)	20.8	(12.9)	21.2	(13.2)
F16	D	4	28.8	(17.9)	29.7	(18.5)	30.3	(18.8)
Reverse Ratios								
R1	A	1	1.4	(0.8)	1.4	(0.9)	1.4	(0.9)
R2	A	2	2.0	(1.2)	2.0	(1.3)	2.1	(1.3)
R3	A	3	2.8	(1.7)	2.9	(1.8)	2.9	(1.8)
R4	A	4	4.0	(2.5)	4.1	(2.6)	4.2	(2.6)
R5	B	1	3.2	(1.2)	3.3	(2.1)	3.4	(2.1)
R6	B	2	4.6	(2.9)	4.8	(3.0)	4.9	(3.0)
R7	B	3	6.7	(4.1)	6.9	(4.3)	7.0	(4.4)
R8	B	4	9.6	(5.9)	9.9	(6.1)	10.1	(6.2)
R9	C	1	3.9	(2.4)	4.0	(2.5)	4.1	(2.5)
R10	C	2	5.6	(3.5)	5.8	(3.6)	5.9	(3.7)
R11	C	3	8.0	(5.0)	8.3	(5.2)	8.5	(5.3)
R12	C	4	11.5	(7.2)	11.9	(7.4)	12.1	(7.5)
R13	D	1	9.5	(5.9)	9.8	(6.1)	10.0	(6.2)
R14	D	2	13.7	(8.5)	14.1	(8.8)	14.4	(8.9)
R15	D	3	19.7	(12.2)	20.3	(12.6)	20.7	(12.9)
R16	D	4	28.2	(17.5)	29.1	(18.1)	29.6	(18.4)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h 32 x 32 Transmission and Creeper Gears Selected

Gear Ratio	Shift Lever Positions: Range lever	Shift Lever Positions: Main lever	Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios								
F1	A	1	0.23	(0.14)	0.24	(0.15)	0.24	(0.15)
F2	A	2	0.33	(0.21)	0.34	(0.21)	0.35	(0.22)
F3	A	3	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F4	A	4	0.68	(0.43)	0.71	(0.44)	0.72	(0.45)
F5	B	1	0.55	(0.34)	0.57	(0.35)	0.58	(0.36)
F6	B	2	0.79	(0.49)	0.82	(0.51)	0.83	(0.52)
F7	B	3	1.14	(0.71)	1.17	(0.73)	1.20	(0.74)
F8	B	4	1.63	(1.01)	1.68	(1.05)	1.71	(1.07)
F9	C	1	0.66	(0.41)	0.68	(0.42)	0.70	(0.43)
F10	C	2	0.95	(0.59)	0.98	(0.61)	1.00	(0.62)
F11	C	3	1.37	(0.85)	1.41	(0.88)	1.44	(0.90)
F12	C	4	1.97	(1.22)	2.03	(1.26)	2.07	(1.28)
F13	D	1	1.62	(1.00)	1.67	(1.04)	1.70	(1.06)
F14	D	2	2.33	(1.45)	2.40	(1.49)	2.45	(1.52)
F15	D	3	3.35	(2.08)	3.46	(2.15)	3.53	(2.19)
F16	D	4	4.81	(2.99)	4.96	(3.08)	5.05	(3.14)
Reverse Ratios								
R1	A	1	0.23	(0.14)	0.23	(0.14)	0.24	(0.15)
R2	A	2	0.32	(0.20)	0.33	(0.21)	0.34	(0.21)
R3	A	3	0.47	(0.29)	0.48	(0.30)	0.49	(0.31)
R4	A	4	0.67	(0.42)	0.69	(0.43)	0.70	(0.44)
R5	B	1	0.54	(0.33)	0.55	(0.34)	0.56	(0.35)
R6	B	2	0.77	(0.48)	0.80	(0.50)	0.81	(0.50)
R7	B	3	1.11	(0.69)	1.15	(0.71)	1.17	(0.73)
R8	B	4	1.59	(0.99)	1.64	(1.02)	1.68	(1.04)
R9	C	1	0.65	(0.40)	0.67	(0.41)	0.68	(0.42)
R10	C	2	0.93	(0.58)	0.96	(0.60)	0.98	(0.61)
R11	C	3	1.34	(0.83)	1.38	(0.86)	1.41	(0.88)
R12	C	4	1.92	(1.19)	1.98	(1.23)	2.02	(1.26)
R13	D	1	1.58	(0.98)	1.63	(1.01)	1.66	(1.03)
R14	D	2	2.28	(1.42)	2.35	(1.46)	2.40	(1.49)
R15	D	3	3.28	(2.04)	3.38	(2.10)	3.45	(2.14)
R16	D	4	4.70	(2.92)	4.84	(3.01)	4.94	(3.07)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 40 Km/h 20 x 16 Transmission

Gear Ratio	Shift Lever Positions		Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
	Range lever	Main lever						
Forward Ratios								
F1	A	1	1.4	(0.9)	1.4	(0.9)	1.5	(0.9)
F2	A	2	2.0	(1.2)	2.1	(1.3)	2.1	(1.3)
F3	A	3	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F4	A	4	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)
F5	A	5	5.3	(3.3)	5.4	(3.4)	5.5	(3.4)
F6	B	1	3.3	(2.0)	3.4	(2.1)	3.5	(2.2)
F7	B	2	4.7	(3.0)	4.9	(3.0)	5.0	(3.1)
F8	B	3	6.8	(4.2)	7.0	(4.4)	7.2	(4.5)
F9	B	4	9.8	(6.1)	10.1	(6.3)	10.3	(6.4)
F10	B	5	12.5	(7.8)	12.9	(8.0)	13.2	(8.2)
F11	C	1	4.0	(2.5)	4.1	(2.5)	4.2	(2.6)
F12	C	2	5.7	(3.6)	5.9	(3.7)	6.0	(3.7)
F13	C	3	8.2	(5.1)	8.5	(5.3)	8.7	(5.4)
F14	C	4	11.8	(7.3)	12.2	(7.6)	12.4	(7.7)
F15	C	5	15.1	(9.4)	15.6	(9.7)	15.9	(9.9)
F16	D	1	9.7	(6.0)	10.0	(6.2)	10.2	(6.3)
F17	D	2	14.0	(8.7)	14.4	(9.0)	14.7	(9.1)
F18	D	3	20.1	(12.5)	20.8	(12.9)	21.2	(13.2)
F19	D	4	28.8	(17.9)	29.7	(18.5)	30.3	(18.8)
F20	D	5	37.0	(23.0)	38.2	(23.7)	38.9	(24.2)
Reverse Ratios								
R1	A	1	1.4	(0.8)	1.4	(0.9)	1.4	(0.9)
R2	A	2	2.0	(1.2)	2.0	(1.3)	2.1	(1.3)
R3	A	3	2.8	(1.7)	2.9	(1.8)	2.9	(1.8)
R4	A	4	4.0	(2.5)	4.1	(2.6)	4.2	(2.6)
R5	B	1	3.2	(1.2)	3.3	(2.1)	3.4	(2.1)
R6	B	2	4.6	(2.9)	4.8	(3.0)	4.9	(3.0)
R7	B	3	6.7	(4.1)	6.9	(4.3)	7.0	(4.4)
R8	B	4	9.6	(5.9)	9.9	(6.1)	10.1	(6.2)
R9	C	1	3.9	(2.4)	4.0	(2.5)	4.1	(2.5)
R10	C	2	5.6	(3.5)	5.8	(3.6)	5.9	(3.7)
R11	C	3	8.0	(5.0)	8.3	(5.2)	8.5	(5.3)
R12	C	4	11.5	(7.2)	11.9	(7.4)	12.1	(7.5)
R13	D	1	9.5	(5.9)	9.8	(6.1)	10.0	(6.2)
R14	D	2	13.7	(8.5)	14.1	(8.8)	14.4	(8.9)
R15	D	3	19.7	(12.2)	20.3	(12.6)	20.7	(12.9)
R16	D	4	28.2	(17.5)	29.1	(18.1)	29.6	(18.4)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 40 Km/h 40 x 32 Transmission and Creeper Gears Selected

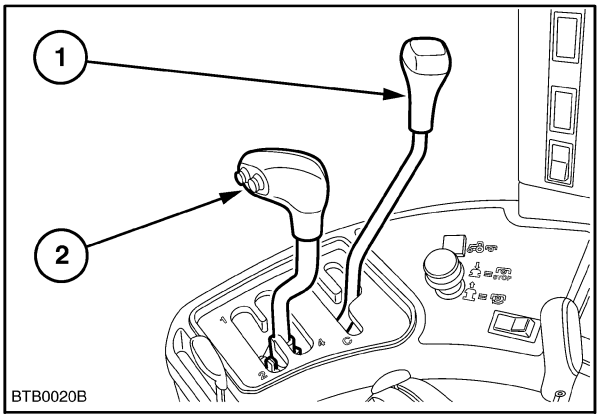
Gear Ratio	Shift Lever Positions: Range lever	Shift Lever Positions: Main lever	Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios								
F1	A	1	0.23	(0.14)	0.24	(0.15)	0.24	(0.15)
F2	A	2	0.33	(0.21)	0.34	(0.21)	0.35	(0.22)
F3	A	3	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F4	A	4	0.68	(0.43)	0.71	(0.44)	0.72	(0.45)
F5	A	5	0.88	(0.55)	0.91	(0.56)	0.92	(0.57)
F6	B	1	0.55	(0.34)	0.57	(0.35)	0.58	(0.36)
F7	B	2	0.79	(0.49)	0.82	(0.51)	0.83	(0.52)
F8	B	3	1.14	(0.71)	1.17	(0.73)	1.20	(0.74)
F9	B	4	1.63	(1.01)	1.68	(1.05)	1.71	(1.07)
F10	B	5	2.09	(1.30)	2.16	(1.34)	2.20	(1.37)
F11	C	1	0.66	(0.41)	0.68	(0.42)	0.70	(0.43)
F12	C	2	0.95	(0.59)	0.98	(0.61)	1.00	(0.62)
F13	C	3	1.37	(0.85)	1.41	(0.88)	1.44	(0.90)
F14	C	4	1.97	(1.22)	2.03	(1.26)	2.07	(1.28)
F15	C	5	2.52	(1.57)	2.60	(1.62)	2.65	(1.65)
F16	D	1	1.62	(1.00)	1.67	(1.04)	1.70	(1.06)
F17	D	2	2.33	(1.45)	2.40	(1.49)	2.45	(1.52)
F18	D	3	3.35	(2.08)	3.46	(2.15)	3.53	(2.19)
F19	D	4	4.81	(2.99)	4.96	(3.08)	5.05	(3.14)
F20	D	5	6.17	(3.83)	6.36	(3.95)	6.48	(4.03)
Reverse Ratios								
R1	A	1	0.23	(0.14)	0.23	(0.14)	0.24	(0.15)
R2	A	2	0.32	(0.20)	0.33	(0.21)	0.34	(0.21)
R3	A	3	0.47	(0.29)	0.48	(0.30)	0.49	(0.31)
R4	A	4	0.67	(0.42)	0.69	(0.43)	0.70	(0.44)
R5	B	1	0.54	(0.33)	0.55	(0.34)	0.56	(0.35)
R6	B	2	0.77	(0.48)	0.80	(0.50)	0.81	(0.50)
R7	B	3	1.11	(0.69)	1.15	(0.71)	1.17	(0.73)
R8	B	4	1.59	(0.99)	1.64	(1.02)	1.68	(1.04)
R9	C	1	0.65	(0.40)	0.67	(0.41)	0.68	(0.42)
R10	C	2	0.93	(0.58)	0.96	(0.60)	0.98	(0.61)
R11	C	3	1.34	(0.83)	1.38	(0.86)	1.41	(0.88)
R12	C	4	1.92	(1.19)	1.98	(1.23)	2.02	(1.26)
R13	D	1	1.58	(0.98)	1.63	(1.01)	1.66	(1.03)
R14	D	2	2.28	(1.42)	2.35	(1.46)	2.40	(1.49)
R15	D	3	3.28	(2.04)	3.38	(2.10)	3.45	(2.14)
R16	D	4	4.70	(2.92)	4.84	(3.01)	4.94	(3.07)

DUAL COMMAND™ TRANSMISSION (TM115, TM125 and TM135 only)

Because of speed restrictions operating in certain countries one or more ratios may be blocked out to reduce maximum speed and meet legal requirements. This will be explained in further detail within the text.

All gear levers, as well as the throttle controls, are colour-coded orange.

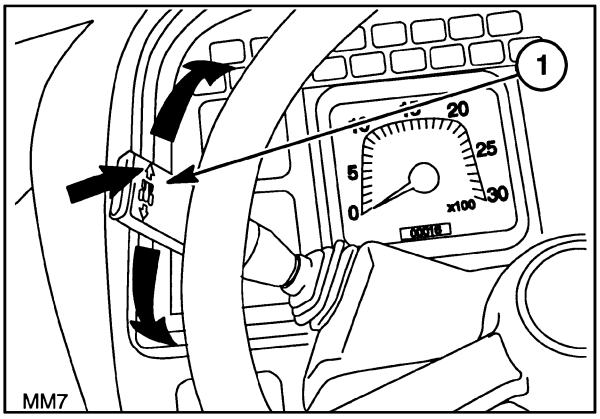
This fully synchromesh transmission offers 23 forward gear ratios with 30 km/h transmission and 24 with 40 kph transmission. Both versions have12 reverse ratios. The optional creeper gears will double the number of available gear ratios, both forward and reverse. Details of creeper gear operation will be found on page 2-64.



115

Figure 115

Operation is by means of the main shift lever (2) and the range lever (1). The shuttle lever (1) Figure 116, is used to select forward or reverse travel.



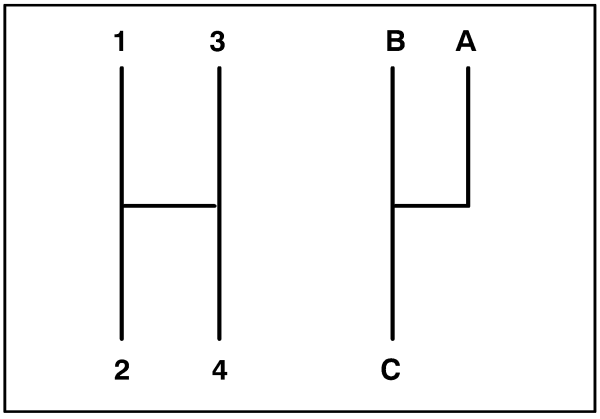
116

Main Gear Shift Lever - Figure 117

The main gear shift lever (left-hand lever) operates in a conventional H-pattern and, in conjunction with the clutch pedal, is used to select any of four gear ratios, whether the tractor is stationary or moving. See Figure 117 for gear shift pattern.

Range Lever - Figure 117

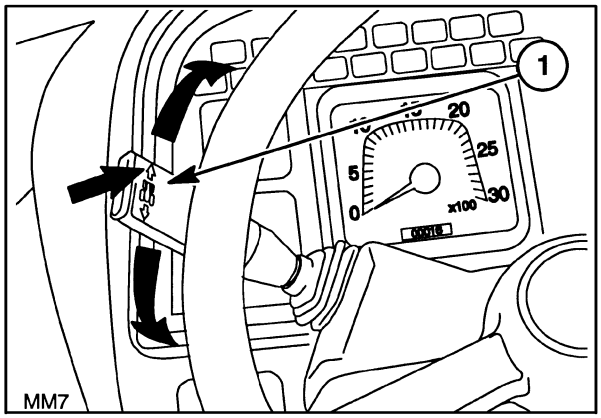
The range lever (right-hand lever), in conjunction with the clutch pedal, is used to select any one of three ranges (A, B and C), which has the effect of tripling the number of ratios to 12, both in forward and reverse. The design of the transmission permits changes between the medium (B) and high (C) ranges while the tractor is moving. Stop the tractor to select range (A).



117

Shuttle Lever - Figure 118

The shuttle lever (1), located to the left of the steering wheel, is used to select forward or reverse travel when a gear ratio is engaged. To reverse the direction of travel, reduce engine and tractor speed, pull the shuttle lever toward the steering wheel, against light spring pressure, and move it up for forward travel or down for reverse travel. It is not necessary to depress the clutch pedal when actuating the shuttle lever.



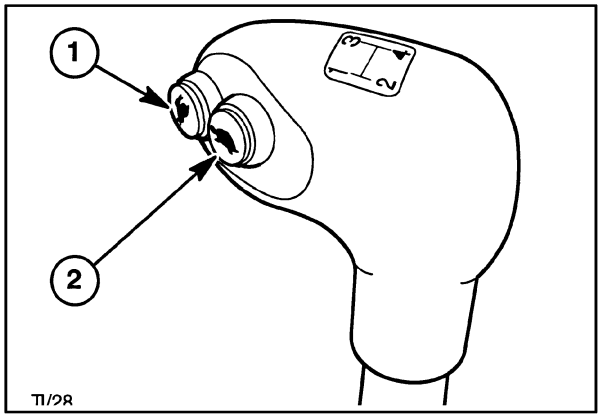
118

NOTE: *If the shuttle lever is moved to the forward or reverse position with the handbrake engaged, an audible alarm will be heard. Additionally, forward or reverse drive cannot be engaged unless the operator is in the tractor seat and either:-*
The clutch pedal is depressed and released with the F-N-R lever in the neutral position.
OR
The handbrake is released with the F-N-R lever in the neutral position.

NOTE: *When operating in temperatures below -18° C (0° F) with cold transmission oil, operate in underdrive and avoid shuttle operations, as far as practicable, until the oil has warmed up.*

Dual Command Function - Figure 119

An hydraulically operated gear set within the transmission housing allows the operator to select underdrive in any forward gear while on the move. This, effectively, increases torque, reduces tractor speed by approximately 16.4% and doubles the number of forward gear ratios to 24.



119

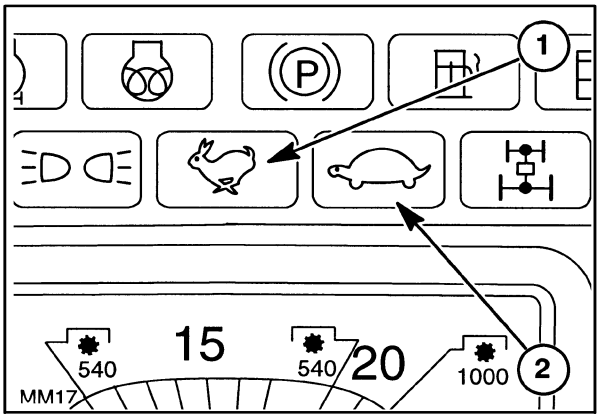
NOTE: *In countries where speed is limited to 30 km/h, 24th. ratio (12th. gear direct drive) is not available. Operation of the transmission is otherwise identical to the 40 km/h transmission.*

As the Hi or Lo gears are hydraulically engaged it is not necessary to use the clutch when operating the buttons.

Press button (2) (tortoise symbol), to instantly engage Lo, reducing tractor speed and increasing pulling power. Press button (1) (hare symbol) to instantly revert to Hi and increase tractor speed.

Figure 120

The amber indicator light (2) on the instrument panel will illuminate when the 'tortoise' button is pressed to select Lo. Similarly, the green indicator light (1) will illuminate when the 'hare' button is pressed to select Hi. The lights also have tortoise and hare symbols on them to indicate low and high speeds.



120

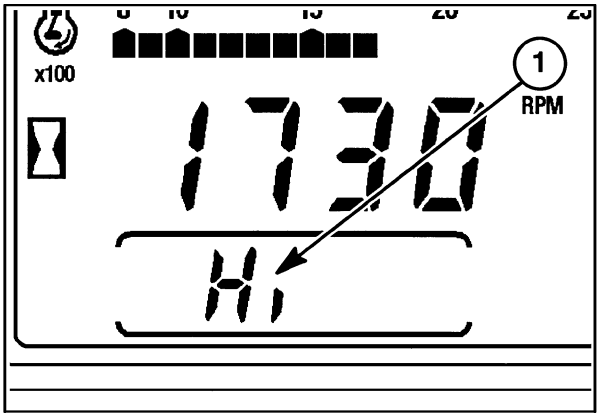
Figure 121

If your tractor is equipped with an electronic instrument panel then 'Hi' will be displayed (1) in the lower, central panel when Hi is engaged. Similarly, if Lo is selected, then 'Lo' will be displayed.

NOTE: *Reverse gears operate only in Lo drive. When operating in a forward gear in Hi, selection of a reverse ratio will cause the Dual Command function to automatically select Lo.*

⚠ WARNING ⚠

To prevent inadvertent tractor movement, always place all gear shift levers in neutral and firmly apply the parking brake before stopping the engine and leaving the tractor. The transmission will not prevent the tractor from rolling when the engine is shut off.



121

IMPORTANT: *Fully depress the clutch pedal when changing gear. Partially depressing the clutch pedal when changing gear may result in damage to transmission components. Also, when changing down on the move, select the next consecutive gear in order to avoid damage to the clutch and/or overspeeding of the engine.*

IMPORTANT: *Tractors fitted with this transmission must* ***not*** *be tow started. When using a slave battery to start the engine ensure that the polarity is correct* ***positive to positive, negative to negative,*** *otherwise the alternator may be damaged.*

IMPORTANT: *If it is necessary to tow the tractor, all* ***gear levers must*** *be moved to the* ***neutral position before*** *stopping the engine otherwise damage to transmission components may occur during towing. If creeper gears (reduction gear set) are fitted, then the selector lever must be in the* ***off*** *position.*

CREEPER GEARS (where fitted)

For operations requiring extra low ground speeds, a reduction gear set (creeper gears) is available. The reduction gear set is installed within the main transmission housing and has a reduction ratio of 6:1.

With creeper gears, the number of available ratios is doubled to:

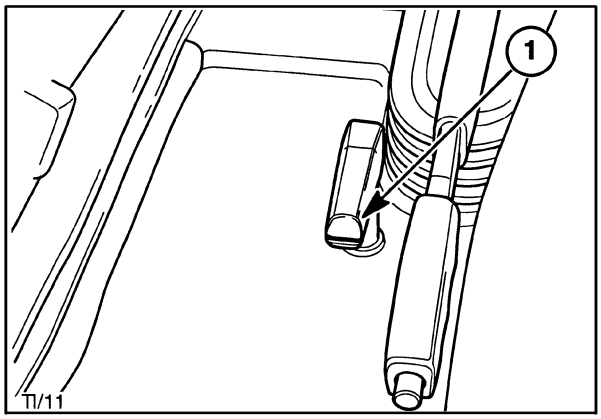
40 km/h - 48 forward and 24 reverse ratios

30 km/h - 46 forward and 24 reverse ratios.

Creeper gear selection - Figure 122

Pull the creeper gears selector (1) up to engage the creeper range. Push down to disengage creeper gear.

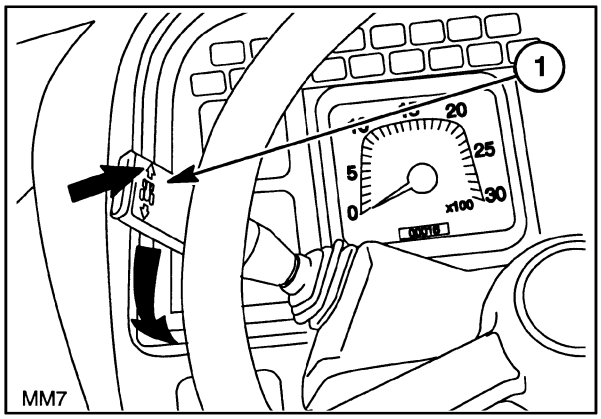
IMPORTANT: *Creeper gears offer very low ground speeds. Do* ***not*** *use the low gearing advantage to apply excessive draft loads to the tractor. Do* ***not*** *use creeper gears in the high range for operations requiring full engine power.*



122

Figure 123

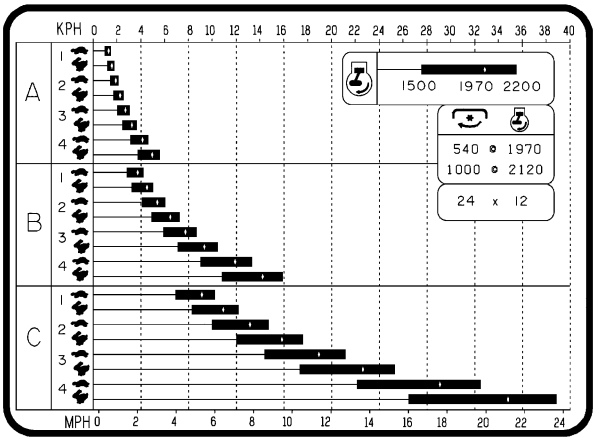
To reverse the direction of travel, reduce engine speed, lift the shuttle lever (1) and move it down.



123

GROUND SPEED DECAL - Figure 124

A decal similar to that shown is affixed to the lower, front corner of the right-hand window. The decal illustrates the approximate ground speed in all ratios at three alternative engine speeds.



124

The left edge of each block represents an engine speed of 1500 rev/min. and the right-hand edge rated speed (2200 rev/min). A white dot in the centre of each block depicts the engine speed at which the 540 rev/min. P.T.O. speed of is obtained (1970 rev.min).

To find the ground speed at 2200 engine rev/min. in 4th gear range B, underdrive, follow the right-hand edge on the B4 'tortoise' block, up to the kph line or down to the MPH line. In the example shown, the ground speed indicated is 13.3 kph or 8.3 MPH.

Ground Speed Charts

The ground speed of your tractor may be displayed on the instrument panel. If your tractor is equipped with radar then the ground speed displayed will be a true reading. Tractors without radar will display a ground speed that is subject to minor inaccuracies due to the effects of wheel slip, tyre pressures, etc.

The charts on the following pages show the ground speeds in km/h and MPH. To find the road speed for your tractor in any given gear ratio, use the column with your rear tyre size in the heading.

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (23 x 12) or 40 Km/h Transmission (24 x 12) - TM115 and TM125 only

Gear Ratio	Shift Lever Positions: Range lever	Main lever	Hi / Lo Buttons	Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios									
F1	A	1	Lo	1.4	(0.9)	1.4	(0.9)	1.5	(0.9)
F2	A	1	Hi	1.7	(1.0)	1.7	(1.1)	1.7	(1.1)
F3	A	2	Lo	2.0	(1.2)	2.1	(1.3)	2.1	(1.3)
F4	A	2	Hi	2.4	(1.5)	2.5	(1.5)	2.5	(1.6)
F5	A	3	Lo	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F6	A	3	Hi	3.4	(2.1)	3.5	(2.2)	3.6	(2.2)
F7	A	4	Lo	4.4	(2.7)	4.5	(2.8)	4.6	(2.9)
F8	A	4	Hi	5.3	(3.3)	5.4	(3.4)	5.5	(3.4)
F9	B	5	Lo	4.0	(2.5)	4.1	(2.5)	4.2	(2.6)
F10	B	5	Hi	4.7	(3.0)	4.9	(3.0)	5.0	(3.1)
F11	B	6	Lo	5.7	(3.6)	5.9	(3.7)	6.0	(3.7)
F12	B	6	Hi	6.8	(4.3)	7.1	(4.4)	7.2	(4.5)
F13	B	7	Lo	8.2	(5.1)	8.5	(5.3)	8.7	(5.4)
F14	B	7	Hi	9.8	(6.1)	10.2	(6.3)	10.3	(6.4)
F15	B	8	Lo	12.7	(7.9)	13.1	(8.1)	13.3	(8.3)
F16	B	8	Hi	15.1	(9.4)	15.6	(9.7)	15.9	(9.9)
F17	C	9	Lo	9.7	(6.0)	10.0	(6.2)	10.2	(6.3)
F18	C	9	Hi	11.6	(7.2)	12.0	(7.5)	12.2	(7.6)
F19	C	10	Lo	14.0	(8.7)	14.4	(9.0)	14.7	(9.1)
F20	C	10	Hi	16.7	(10.4)	17.3	(10.7)	17.6	(10.9)
F21	C	11	Lo	20.1	(12.5)	20.8	(12.9)	21.2	(13.2)
F22	C	11	Hi	24.1	(15.0)	24.8	(15.4)	25.3	(15.7)
F23	C	12	Lo	30.9	(19.2)	31.9	(19.8)	32.5	(20.2)
F24	C	12	Hi	37.0	(23.0)	38.2	(23.7)	38.9	(24.2)
NOTE: Ratio F24 is only available on 40 Km/h transmissions									
Reverse Ratios									
R1	A	1	-	1.3	(0.8)	1.3	(0.8)	1.3	(0.8)
R2	A	2	-	1.8	(1.1)	1.9	(1.2)	1.9	(1.2)
R3	A	3	-	2.6	(1.6)	2.7	(1.7)	2.7	(1.7)
R4	A	4	-	4.0	(2.5)	4.1	(2.6)	4.2	(2.6)
R5	B	1	-	3.6	(2.2)	3.7	(2.3)	3.8	(2.4)
R6	B	2	-	5.2	(3.2)	5.4	(3.3)	5.5	(3.4)
R7	B	3	-	7.5	(4.7)	7.7	(4.8)	7.9	(4.9)
R8	B	4	-	11.5	(7.2)	11.9	(7.4)	12.1	(7.5)
R9	C	1	-	8.8	(5.5)	9.1	(5.7)	9.3	(5.8)
R10	C	2	-	12.7	(7.9)	13.1	(8.2)	13.4	(8.3)
R11	C	3	-	18.3	(11.4)	18.9	(11.7)	19.3	(12.0)
R12	C	4	-	28.2	(17.5)	29.1	(18.1)	29.6	(18.4)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (46 x 12) or 40 Km/h Transmision (48 x 12) and Creeper Gears Selected - TM115 and TM125 only

Gear Ratio	Shift Lever Positions: Range lever	Main lever	Hi / Lo Buttons	Rear Tyre Size 16.9-38, 16.9R-38 and 480/70R-38		Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios									
F1	A	1	Lo	0.23	(0.14)	0.24	(0.15)	0.24	(0.15)
F2	A	1	Hi	0.28	(0.17)	0.28	(0.18)	0.29	(0.18)
F3	A	2	Lo	0.33	(0.21)	0.34	(0.21)	0.35	(0.22)
F4	A	2	Hi	0.40	(0.25)	0.41	(0.25)	0.42	(0.26)
F5	A	3	Lo	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F6	A	3	Hi	0.57	(0.35)	0.59	(0.37)	0.60	(0.37)
F7	A	4	Lo	0.73	(0.46)	0.76	(0.47)	0.77	(0.48)
F8	A	4	Hi	0.88	(0.55)	0.91	(0.56)	0.92	(0.57)
F9	B	5	Lo	0.66	(0.41)	0.68	(0.42)	0.70	(0.43)
F10	B	5	Hi	0.79	(0.49)	0.82	(0.51)	0.83	(0.52)
F11	B	6	Lo	0.95	(0.59)	0.98	(0.61)	1.00	(0.62)
F12	B	6	Hi	1.14	(0.71)	1.18	(0.73)	1.16	(0.75)
F13	B	7	Lo	1.37	(0.85)	1.41	(0.88)	1.44	(0.90)
F14	B	7	Hi	1.64	(1.02)	1.69	(1.05)	1.72	(1.07)
F15	B	8	Lo	2.11	(1.31)	2.18	(1.35)	2.22	(1.38)
F16	B	8	Hi	2.52	(1.57)	2.60	(1.62)	2.65	(1.65)
F17	C	9	Lo	1.62	(1.00)	1.67	(1.04)	1.70	(1.06)
F18	C	9	Hi	1.93	(1.20)	1.99	(1.24)	2.03	(1.26)
F19	C	10	Lo	2.33	(1.45)	2.40	(1.49)	2.45	(1.52)
F20	C	10	Hi	2.79	(1.73)	2.87	(1.79)	2.93	(1.82)
F21	C	11	Lo	3.35	(2.08)	3.46	(2.15)	3.53	(2.19)
F22	C	11	Hi	4.01	(2.49)	4.14	(2.57)	4.22	(2.62)
F23	C	12	Lo	5.16	(3.20)	5.31	(3.30)	5.42	(3.37)
F24	C	12	Hi	6.17	(3.83)	6.36	(3.95)	6.48	(4.03)
NOTE: Ratio F24 is only available on 40 Km/h transmissions									
Reverse Ratios									
R1	A	1	-	0.21	(0.13)	0.22	(0.13)	0.22	(0.14)
R2	A	2	-	0.30	(0.19)	0.31	(0.19)	0.32	(0.20)
R3	A	3	-	0.44	(0.27)	0.45	(0.28)	0.46	(0.28)
R4	A	4	-	0.67	(0.42)	0.69	(0.43)	0.70	(0.44)
R5	B	1	-	0.60	(0.37)	0.62	(0.39)	0.63	(0.39)
R6	B	2	-	0.87	(0.54)	0.90	(0.56)	0.91	(0.57)
R7	B	3	-	1.25	(0.78)	1.29	(0.80)	1.31	(0.82)
R8	B	4	-	1.92	(1.19)	1.98	(1.23)	2.02	(1.26)
R9	C	1	-	1.47	(0.92)	1.52	(0.94)	1.55	(0.96)
R10	C	2	-	2.12	(1.32)	2.19	(1.36)	2.23	(1.39)
R11	C	3	-	3.05	(1.90)	3.15	(1.96)	3.21	(2.00)
R12	C	4	-	4.70	(2.92)	4.84	(3.01)	4.94	(3.07)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h (23 x 12) Transmission or 40 Km/h Transmission (24 x 12) - TM135 only

Gear Ratio	Shift Lever Positions: Range lever	Main lever	Hi / Lo Buttons	Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38, 20.8R-38, 580/70R-38, 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios											
F1	A	1	Lo	1.4	(0.9)	1.4	(0.9)	1.4	(0.9)	1.5	0.9)
F2	A	1	Hi	1.6	(1.0)	1.7	(1.0)	1.7	(1.1)	1.7	(1.1)
F3	A	2	Lo	2.0	(1.2)	2.0	(1.3)	2.1	(1.3)	2.1	(1.3)
F4	A	2	Hi	2.4	(1.5)	2.4	(1.5)	2.5	(1.5)	2.5	(1.6)
F5	A	3	Lo	2.8	(1.8)	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F6	A	3	Hi	3.4	(2.1)	3.5	(2.2)	3.5	(2.2)	3.6	(2.2)
F7	A	4	Lo	4.4	(2.7)	4.4	(2.8)	4.6	(2.8)	4.6	(2.9)
F8	A	4	Hi	5.2	(3.2)	5.3	(3.3)	5.4	(3.4)	5.5	(3.4)
F9	B	5	Lo	3.9	(2.4)	4.0	(2.5)	4.1	(2.5)	4.2	(2.6)
F10	B	5	Hi	4.7	(2.9)	4.8	(3.0)	4.9	(3.0)	5.0	(3.1)
F11	B	6	Lo	5.7	(3.5)	5.8	(3.6)	5.9	(3.7)	6.0	(3.7)
F12	B	6	Hi	6.8	(4.2)	6.9	(4.3)	7.1	(4.4)	7.2	(4.5)
F13	B	7	Lo	8.2	(5.1)	8.3	(5.2)	8.5	(5.3)	8.6	(5.4)
F14	B	7	Hi	9.7	(6.1)	9.9	(6.2)	10.2	(6.3)	10.3	(6.4)
F15	B	8	Lo	12.5	(7.8)	12.8	(7.9)	13.1	(8.1)	13.3	(8.3)
F16	B	8	Hi	15.0	(9.3)	15.3	(9.5)	15.6	(9.7)	15.9	(9.9)
F17	C	9	Lo	9.6	(6.0)	9.8	(6.1)	10.0	(6.2)	10.2	(6.3)
F18	C	9	Hi	11.5	(7.1)	11.7	(7.3)	12.0	(7.4)	12.2	(7.6)
F19	C	10	Lo	13.9	(8.6)	14.1	(8.8)	14.4	(9.0)	14.7	(9.1)
F20	C	10	Hi	16.6	(10.3)	16.9	(10.5)	17.3	(10.7)	17.6	(10.9)
F21	C	11	Lo	19.9	(12.4)	20.3	(12.6)	20.8	(12.9)	21.1	(13.1)
F22	C	11	Hi	23.8	(14.8)	24.3	(15.1)	24.8	(15.4)	25.3	(15.7)
F23	C	12	Lo	30.6	(19.0)	31.2	(19.4)	31.9	(19.9)	32.5	(20.2)
F24	C	12	Hi	36.6	(22.8)	37.3	(23.2)	38.2	(23.7)	38.9	(24.2)
NOTE: Ratio F24 is only available on 40 Km/h transmissions											
Reverse Ratios											
R1	A	1	-	1.2	(0.8)	1.3	(0.8)	1.3	(0.8)	1.3	(0.8)
R2	A	2	-	1.8	(1.1)	1.8	(1.1)	1.9	(1.2)	1.9	(1.2)
R3	A	3	-	2.6	(1.6)	2.6	(1.6)	2.7	(1.7)	2.7	(1.7)
R4	A	4	-	4.0	(2.5)	4.1	(2.5)	4.1	(2.6)	4.2	(2.6)
R5	B	1	-	3.6	(2.2)	3.6	(2.3)	3.7	(2.3)	3.8	(2.4)
R6	B	2	-	5.2	(3.2)	5.3	(3.3)	5.4	(3.3)	5.5	(3.4)
R7	B	3	-	7.4	(4.6)	7.6	(4.7)	7.7	(4.8)	7.9	(4.9)
R8	B	4	-	11.4	(7.1)	11.6	(7.2)	11.9	(7.4)	12.1	(7.5)
R9	C	1	-	8.7	(5.4)	8.9	(5.5)	9.1	(5.7)	9.3	(5.8)
R10	C	2	-	12.6	(7.8)	12.9	(8.0)	13.2	(8.2)	13.4	(8.3)
R11	C	3	-	18.1	(11.3)	18.5	(11.5)	18.9	(11.8)	19.3	(12.0)
R12	C	4	-	27.9	(17.3)	28.5	(17.7)	29.1	(18.1)	29.6	(18.4)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (46 x 12) or 40 Km/h Transmission (48 x 12) and Creeper Gears Selected - TM135 only

Gear Ratio	Shift Lever Positions: Range lever	Main lever	Hi / Lo Buttons	Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38, 20.8R-38, 580/70R-38, 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios											
F1	A	1	Lo	0.23	(0.14)	0.23	(0.14)	0.24	(0.15)	0.24	(0.15)
F2	A	1	Hi	0.27	(0.17)	0.28	(0.17)	0.28	(0.18)	0.29	(0.18)
F3	A	2	Lo	0.33	(0.20)	0.33	(0.21)	0.34	(0.21)	0.35	(0.22)
F4	A	2	Hi	0.39	(0.24)	0.40	(0.25)	0.41	(0.25)	0.42	(0.26)
F5	A	3	Lo	0.47	(0.29)	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F6	A	3	Hi	0.57	(0.35)	0.58	(0.36)	0.59	(0.37)	0.60	(0.37)
F7	A	4	Lo	0.73	(0.45)	0.74	(0.46)	0.76	(0.47)	0.77	(0.48)
F8	A	4	Hi	0.87	(0.54)	0.89	(0.55)	0.91	(0.56)	0.92	(0.57)
F9	B	5	Lo	0.65	(0.41)	0.67	(0.41)	0.68	(0.42)	0.69	(0.43)
F10	B	5	Hi	0.78	(0.49)	0.80	(0.50)	0.82	(0.51)	0.83	(0.52)
F11	B	6	Lo	0.94	(0.59)	0.96	(0.60)	0.98	(0.61)	1.00	(0.62)
F12	B	6	Hi	1.13	(0.70)	1.15	(0.71)	1.18	(0.73)	1.20	(0.74)
F13	B	7	Lo	1.36	(0.84)	1.38	(0.86)	1.42	(0.88)	1.44	(0.90)
F14	B	7	Hi	1.62	(1.01)	1.65	(1.03)	1.70	(1.05)	1.72	(1.07)
F15	B	8	Lo	2.09	(1.30)	2.13	(1.32)	2.18	(1.35)	2.22	(1.38)
F16	B	8	Hi	2.50	(1.55)	2.54	(1.58)	2.60	(1.62)	2.65	(1.65)
F17	C	9	Lo	1.60	(0.99)	1.63	(1.01)	1.67	(1.04)	1.70	(1.05)
F18	C	9	Hi	1.91	(1.19)	1.95	(1.21)	1.99	(1.24)	2.03	(1.26)
F19	C	10	Lo	2.31	(1.43)	2.35	(1.46)	2.41	(1.50)	2.45	(1.52)
F20	C	10	Hi	2.76	(1.71)	2.81	(1.75)	2.88	(1.79)	2.93	(1.82)
F21	C	11	Lo	3.32	(2.06)	3.38	(2.10)	3.46	(2.15)	3.52	(2.19)
F22	C	11	Hi	3.97	(2.47)	4.05	(2.51)	4.14	(2.57)	4.21	(2.62)
F23	C	12	Lo	5.11	(3.17)	5.20	(3.23)	5.32	(3.31)	5.42	(3.37)
F24	C	12	Hi	6.10	(3.79)	6.22	(3.87)	6.37	(3.96)	6.48	(4.02)
NOTE: Ratio F24 is only available on 40 Km/h transmissions											
Reverse Ratios											
R1	A	1	-	0.21	(0.13)	0.21	(0.13)	0.22	(0.13)	0.22	(0.14)
R2	A	2	-	0.30	(0.19)	0.30	(0.19)	0.31	(0.19)	0.32	(0.20)
R3	A	3	-	0.43	(0.27)	0.44	(0.27)	0.45	(0.28)	0.46	(0.28)
R4	A	4	-	0.66	(0.41)	0.67	(0.42)	0.69	(0.43)	0.70	(0.44)
R5	B	1	-	0.60	(0.37)	0.61	(0.38)	0.62	(0.39)	0.63	(0.39)
R6	B	2	-	0.86	(0.53)	0.88	(0.54)	0.90	(0.56)	0.91	(0.57)
R7	B	3	-	1.24	(0.77)	1.26	(0.78)	1.29	(0.80)	1.31	(0.82)
R8	B	4	-	1.90	(1.18)	1.94	(1.20)	1.98	(1.23)	2.02	(1.25)
R9	C	1	-	1.46	(0.91)	1.49	(0.92)	1.52	(0.94)	1.55	(0.96)
R10	C	2	-	2.10	(1.31)	2.14	(1.33)	2.19	(1.36)	2.23	(1.39)
R11	C	3	-	3.02	(1.88)	3.08	(1.92)	3.15	(1.96)	3.21	(1.99)
R12	C	4	-	4.65	(2.89)	4.74	(2.95)	4.85	(3.01)	4.93	(3.07)

RANGE COMMAND™ TRANSMISSION (All models)

Range Command is an electronically controlled semi-powershift transmission. Transmission and throttle controls, are colour-coded orange.

The following transmissions are available, subject to legal requirements in your country:

40 km/h transmission	18 forward and 6 reverse ratios plus optional 13 x 6 creeper range.
30 km/h transmission	17 forward and 6 reverse ratios plus optional 13 x 6 creeper range.

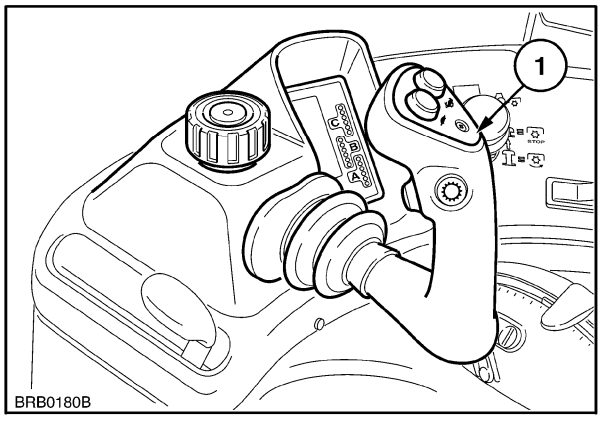
Details of creeper gear operation will be found on page 2-77.

IMPORTANT: *A tractor fitted with Range Command transmission cannot be tow-started and must* ***not*** *be towed other than to remove it from a field or onto a trailer or truck.*

Powershift Control - Figure 125

Range Command transmission is operated by means of a powershift control (1) incorporating three push buttons that are used to make smooth upward or downward gear ratio changes and range changes.

IMPORTANT: *Do* ***not*** *change from one range to another when operating with a ground-engaging implement (ploughing, etc.) as the tractor will stop suddenly.*



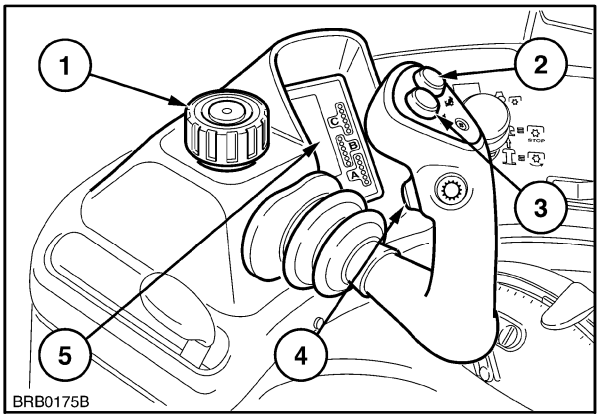
125

Powershift Control - Figure 126

The powershift control is used to select any of six gear ratios. Ratios 1 to 6, in each of the 3 ranges, may be sequentially selected using the upshift button (2) or downshift button (3). The need to make a range change is signalled by means of an audible warning when the limits of the powershift gears are reached.

To change to the next higher range, hold in the range button (4) and press the upshift button (2) or momentarily depress the clutch pedal. To change down a range, hold in the range button (4) and press the downshift button (3) or momentarily depress the clutch pedal. A digital display (5) and LED's next to the powershift control indicate the range and gear selected.

The powershift control may be repositioned to suit the operator. Loosen the clamp knob (1), move the control to the most comfortable position then tighten the knob to clamp it in the new position.



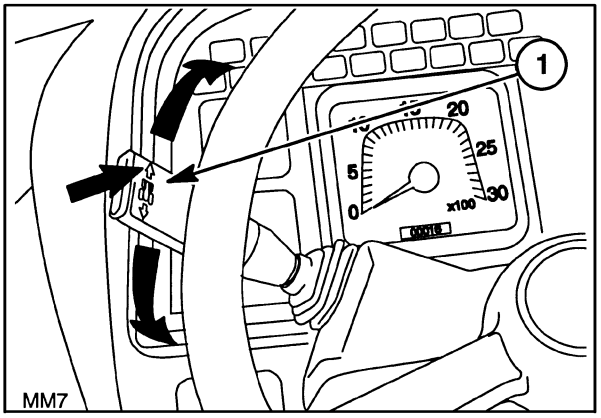
126

Shuttle Lever - Figure 127

Selection of forward or reverse travel is by means of a shuttle lever (1), located to the left of the steering wheel. The lever is spring-loaded to prevent inadvertent movement. It is not necessary to depress the clutch pedal when actuating the shuttle lever.

NOTE: *If the shuttle lever is moved to the forward or reverse position with the handbrake engaged, an audible alarm will be heard. Additionally, forward or reverse drive cannot be engaged unless the operator is in the tractor seat and either:-*
The clutch pedal is depressed and released with the F-N-R lever in the neutral position.
OR
The handbrake is released with the F-N-R lever in the neutral position.

NOTE: *When operating in temperatures below -18° C (0° F) with cold transmission oil, avoid shuttle operations, as far as practicable, until the oil has warmed up.*



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WARNING

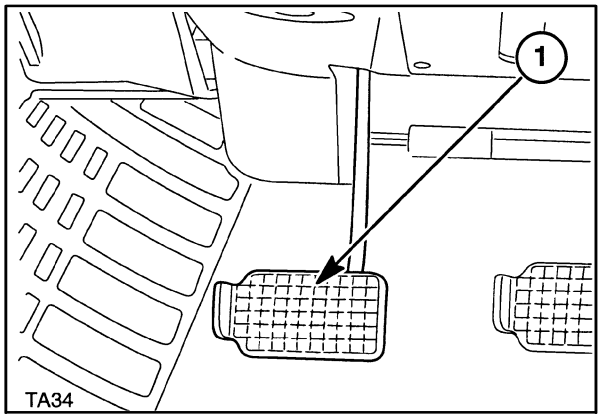
To prevent inadvertent tractor movement, always stop the engine, place the shuttle lever in neutral and firmly apply the parking brake before leaving the tractor. The transmission will not prevent the tractor from rolling when the engine is shut off.

Clutch Pedal - Figure 128

A clutch pedal (1) is provided but is not required for gear, range or forward/reverse changes.

The clutch pedal is required only for positioning the tractor to attach equipment or if operating in confined spaces when the low ratios do not provide a slow enough speed, at moderate/low engine speeds, to give precise control.

IMPORTANT: *To avoid premature wear, do not use the clutch pedal as a footrest.*

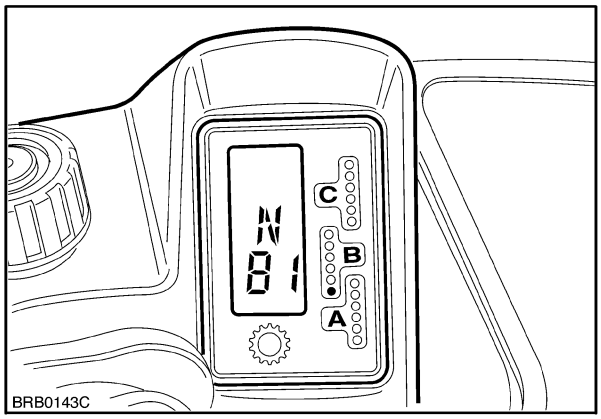


128

Driving the Tractor - Figure 129

Start the engine with the shuttle lever in neutral and the clutch pedal depressed. The LCD on the instrument panel and adjacent to the Powershift control will display 'N' (for neutral) and 'B1'. (When the tractor is initially started, the electronic control will automatically select 1st. gear in range B).

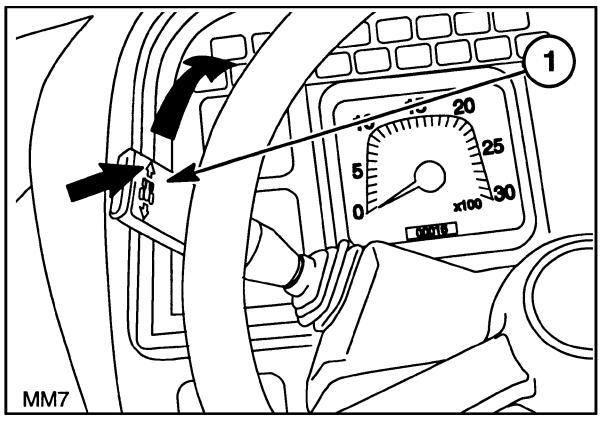
NOTE: *Neutral start switches prevent operation of the starting motor unless the shuttle lever is in neutral and the clutch pedal depressed.*



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Figure 130

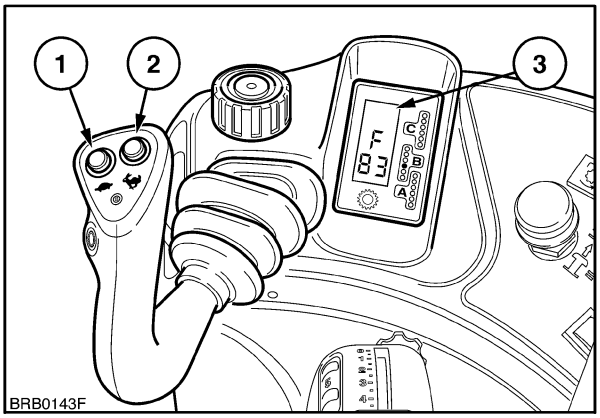
For forward travel, with the engine idling, pull the shuttle lever (1) toward the steering wheel, against light spring-pressure, and move it up.



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Figure 131

Once moving, select the required ratio with the upshift button (2) or downshift button (1), as previously described. An example of the display that you will see is shown at (3), where 'F' indicates forward and 'B3' indicates that 3rd. gear in Range B is selected.



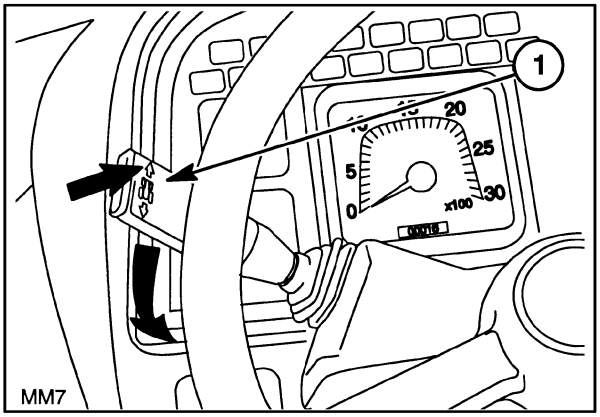
131

NOTE: *An alternative lower or higher ratio may be selected before pulling away. However, if a ratio higher than C1 is selected then the electronic control will select C1, this being the highest ratio permissible when pulling away from a standstill. If, for example, 4th. gear in range C is selected before pulling away, the LED for C4 will flash and the LED for C1 will be steady. The tractor will pull away in C1 and change up, sequentially, to the selected gear as engine load, engine speed and road speed are optimised. The LED's for C2 and C3 gear will illuminate, as these ratios are automatically selected, then the C4 LED will stop flashing and become steady as that gear is reached.*

When changing up or down to an alternative range, the transmission will automatically select the nearest ratio for a smooth change. For example, if travelling forward in the highest ratio in range A (A6) when an upward range change is made, B2 will be selected.

Figure 132

To reverse the direction of travel, reduce engine speed, pull the shuttle lever (1) toward the steering wheel, then move it down.



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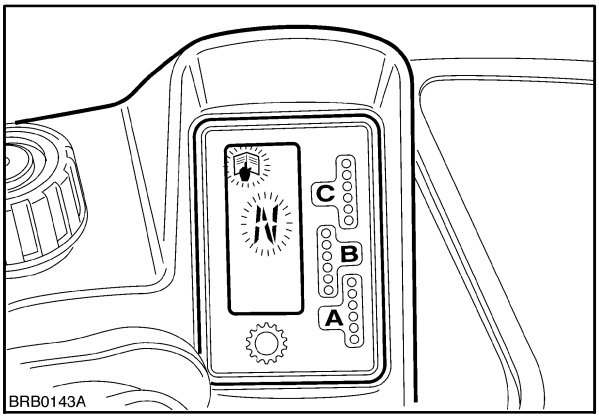
NOTE: *When changing from forward to reverse travel, the nearest available ratio will be selected. As only range B is available in reverse, the ground speed in reverse gear may be different to the speed in the selected forward gear. For example, if C3 is selected in forward travel, then the nearest ratio (B6) will be selected when the shuttle lever is moved to the reverse travel position.*

Figure 133

While driving the tractor in either direction, at speeds greater than 3 km/h (2 mph) with a heavy load on the rear of the tractor, the brakes should be lightly depressed before operating the shuttle lever (without depressing the clutch pedal) to improve the smoothness of the directional change.

Failure to observe this driving technique may possibly result in the transmission not selecting the direction of travel requested, allowing the tractor to continue in the original direction. The letter 'N' and the 'read Operator's Manual' symbol will flash in the gear display adjacent to the powershift control.

Drive is restored by returning the shuttle lever to neutral followed by reselection of forward or reverse, as required.

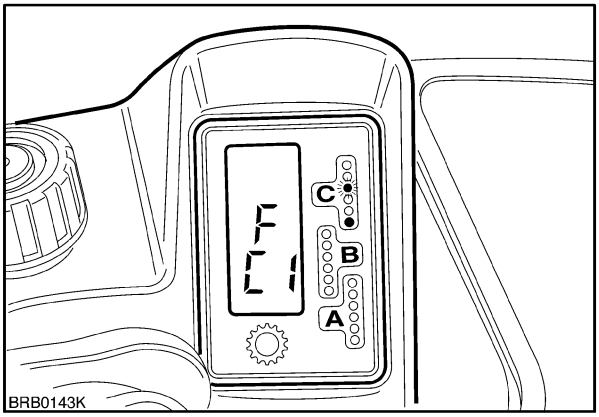


133

Figure 134

When performing shuttle operations, the transmission will 'remember' the previously selected gear. For example, if travelling forward in C4 and the shuttle lever is moved to the reverse position, the transmission will select the highest ratio in reverse (B6).

When the shuttle lever is moved forward again, the LED for ratio C4 will flash, but the nearest ratio (C1) will be selected and the C1 LED will glow. The transmission will then automatically change, sequentially to C2, C3 and then C4, at which point the C4 LED will stop flashing and become steady.

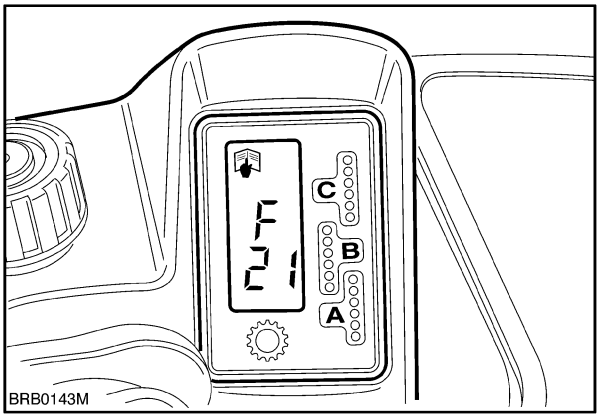


134

Figure 135

In the unlikely event of a fault occurring in the electronic transmission circuitry, the malfunction symbol or warning light and a two-digit error code, preceded by the letter 'F' will flash in the transmission ratio display.

The code indicates the faulty circuit or sensor and the type of fault, e.g., open circuit, short circuit, etc. In this event, the tractor will require the attention of your authorised dealer.



135

Speed Matching

When travelling on the road in range C, the transmission will automatically downshift to match engine speed to road speed if the following method is adopted:

Decrease engine speed, depress the clutch pedal, simultaneously increasing engine speed by pressing the foot throttle further down.

When the clutch pedal is released, the transmission will automatically select a lower gear ratio (provided the lowest speed is not already selected) to approximately match engine speed to road speed.

Programming Reverse Gear Ratios

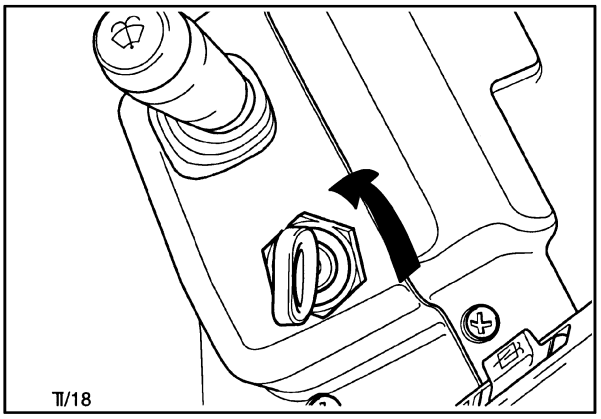
When changing from forward to reverse, the transmission will normally select the same ratio in reverse as was selected for forward travel.

For special shuttle shift applications, Range Command transmission offers the advantage of automatically changing the reverse gear ratio up to three ratios higher or lower than the engaged forward gear ratio.

To programme an alternative reverse gear, proceed as follows:

Figure 136

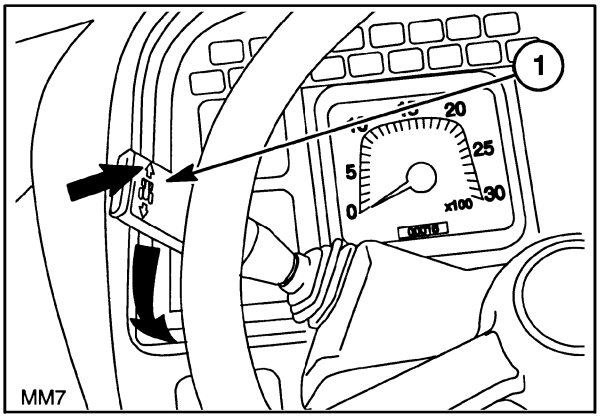
- Turn the key-start switch off.



136

Figure 137

- Move the shuttle lever (1) to the reverse gear position.



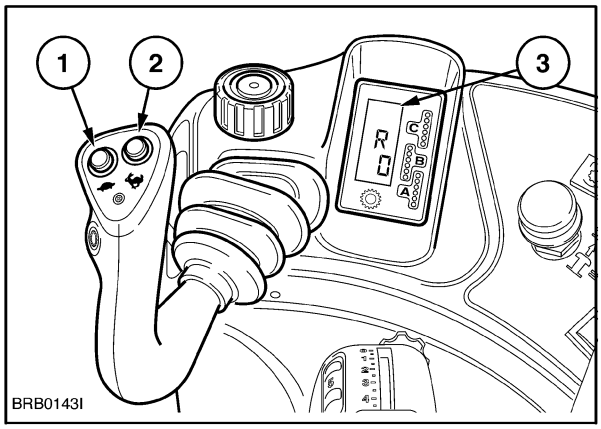
137

Figure 138

- Press and hold down the upshift button (2).

- While holding down the upshift button, turn on the key-start switch (but do not start the engine). The digital display (3) should show ‘R0’ (unless the transmission has previously been programmed to select a higher or lower reverse gear.)

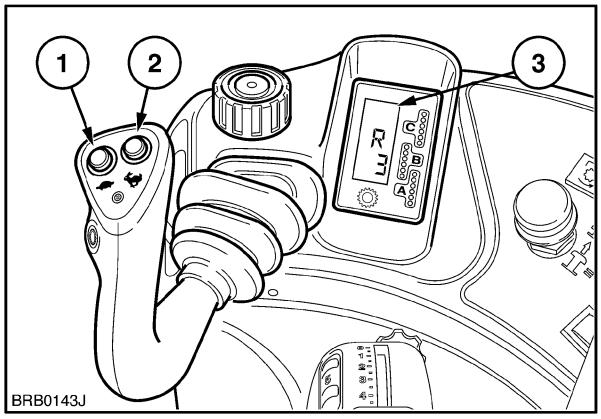
- Release the upshift button. The transmission is now in the programming mode.



138

To programme a higher reverse ratio - Figure 139:

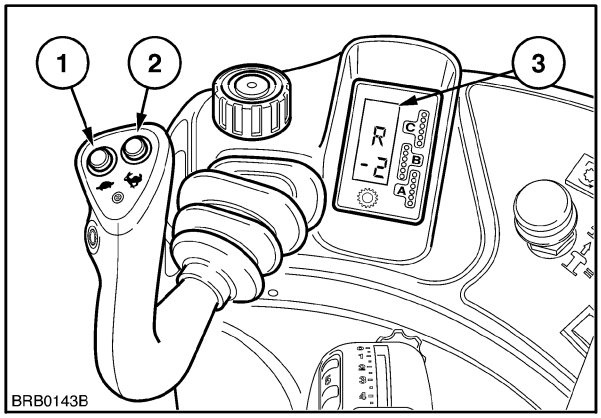
- Press the upshift button (2) one, two or three times, as required. The display (3) will show ‘R1’, ‘R2’ or ‘R3’. This indicates that when reverse is selected the gear will be one, two or three ratios higher than the forward gear ratio.



139

To programme a lower reverse ratio - Figure 140:

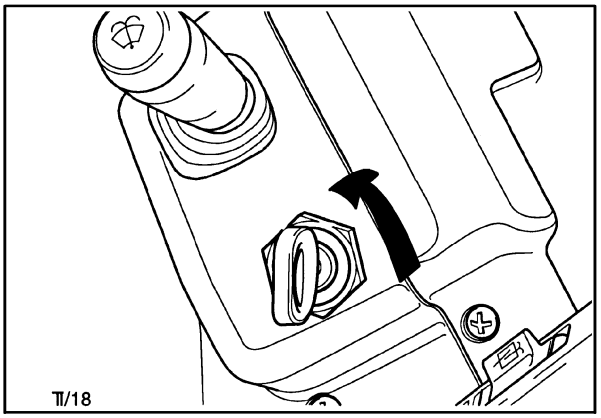
- Press the downshift button (1) one, two or three times, as required. The display (3) will show ‘R-1’, ‘R-2’ or ‘R-3’. This indicates that when reverse is selected the gear will be one, two or three ratios lower than the forward gear ratio.



140

To exit the programme - Figure 141:

- Turn the key-start switch off. The transmission is now programmed.



141

NOTE: *Remember that reverse gears are only available in 'B' range. Consequently, If travelling forward in range C, the transmission will always behave as if the highest ratio in B range (6B) is selected. Therefore, if the transmission has been programmed to select 2 ratios lower in reverse, then R4 will be selected.*

Conversely, if travelling forward in range A, the transmission will always behave as if the lowest ratio in B range (1B) is selected. Therefore, if the transmission has been programmed to select 2 ratios higher in reverse, then R3 will be selected.

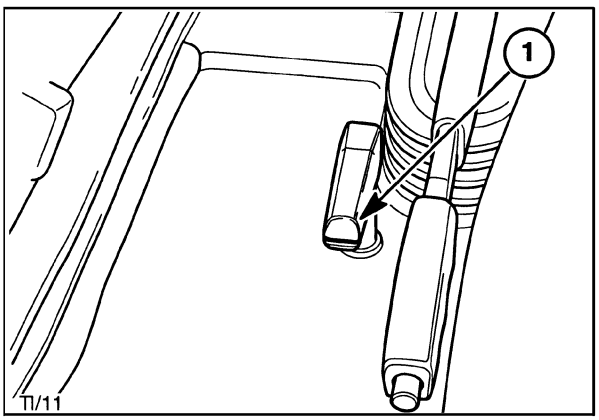
CREEPER GEARS (where fitted)

For operations requiring extra low ground speeds, a reduction gear set (creeper gears) is available. The reduction gear set is installed within the main transmission housing and has a reduction ratio of 6:1.

With the reduction gears, an additional 13 forward and 6 reverse creeper gear ratios are provided. The reduction gear set has the effect of reducing the ratios within the main transmission to provide very low operating speeds.

Creeper gear selection - Figure 142

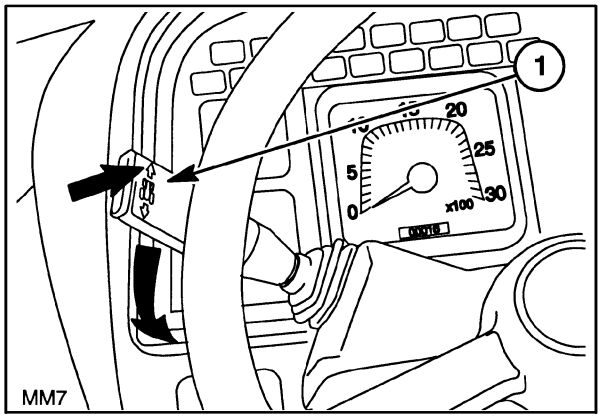
To select the creeper gears, with the engine running and the tractor stationary, engage the required ratio/range. See previous text. Pull the creeper gears selector (1) up to engage the creeper range. Push down to exit the creeper gear mode. Creeper gear selection is denoted by a 'snail' symbol in the top, right-hand corner of the display adjacent to the gear levers.



142

When using the creeper gears only 13 forward gear ratios are available. See the road speed charts on pages 2-82, 2-83 and 2-84 for available ratios.

IMPORTANT: *Creeper gears offer very low ground speeds. Do **not** use the low gearing advantage to apply excessive draft loads to the tractor. Do **not** use creeper gears in the high range for operations requiring full engine power.*



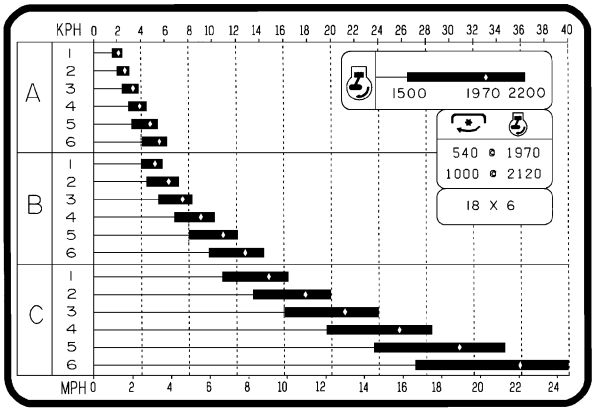
143

Figure 143

To reverse the direction of travel, reduce engine speed, pull the shuttle lever (1) toward the steering wheel, then move it down.

GROUND SPEED DECALS - Figure 144

A decal similar to that shown is affixed to the lower, front corner of the right-hand window. The decals illustrate the approximate ground speed in all ratios at three alternative engine speeds.



144

The left edge of each block represents an engine speed of 1500 rev/min. and the right-hand edge rated speed (2200 rev/min). A white dot in the centre of each block depicts the engine speed at which the 540 rev/min. P.T.O. speed of is obtained (1970 rev.min).

To find the ground speed at 2200 engine rev/min. in 5th gear range C, follow the right-hand edge on the C5 block, up to the kph line or down to the MPH line. In the example shown, the ground speed indicated is 34.5 kph or 21.3 MPH.

Ground Speeds

The ground speed of your tractor may be displayed on the instrument panel. If your tractor is equipped with radar then the ground speed displayed will be a true reading. Tractors without radar will display a ground speed that is subject to minor inaccuracies due to the effects of wheel slip, tyre pressures, change of tyre size, etc.

The charts on the following pages show the ground speeds in km/h and MPH. To find the road speed for your tractor in any given gear ratio, use the column with your rear tyre size in the heading.

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (17 x 6) or 40 Km/h Transmission (18 x 6)

TM115 and TM125 only

Gear Ratio	Range	Rear Tyre Size 16.9-38 16.9R-38 480/70R-38		Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios							
F1	A	2.4	(1.5)	2.5	(1.5)	2.5	(1.6)
F2	A	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F3	A	3.5	(2.1)	3.6	(2.2)	3.6	(2.3)
F4	A	4.2	(2.6)	4.3	(2.7)	4.4	(2.7)
F5	A	5.0	(3.1)	5.1	(3.2)	5.2	(3.3)
F6	A	6.0	(3.7)	6.2	(3.8)	6.3	(3.9)
F1	B	5.5	(3.4)	5.7	(3.6)	5.8	(3.6)
F2	B	6.7	(4.1)	6.9	(4.3)	7.0	(4.4)
F3	B	8.0	(5.0)	8.3	(5.1)	8.4	(5.2)
F4	B	9.6	(6.0)	9.9	(6.2)	10.1	(6.3)
F5	B	11.6	(7.2)	11.9	(7.4)	12.2	(7.6)
F6	B	13.9	(8.7)	14.4	(8.9)	14.7	(9.1)
F1	C	15.7	(9.8)	16.2	(10.1)	16.5	(10.3)
F2	C	18.9	(11.8)	19.5	(12.1)	19.9	(12.4)
F3	C	22.7	(14.1)	23.4	(14.6)	23.9	(14.8)
F4	C	27.3	(17.0)	28.2	(17.5)	28.7	(17.9)
F5	C	32.9	(20.4)	33.9	(21.1)	34.6	(21.5)
F6	C	39.5	(24.6)	40.8	(25.3)	41.6	(25.8)
NOTE: *Ratio F6 in C range is not available on 30 Km/h transmissions.*							
Reverse Ratios							
R1	-	4.7	(2.9)	4.8	(3.0)	4.9	(3.0)
R2	-	5.6	(3.5)	5.8	(3.6)	5.9	(3.7)
R3	-	6.7	(4.2)	6.9	(4.3)	7.1	(4.4)
R4	-	8.1	(5.0)	8.3	(5.2)	8.5	(5.3)
R5	-	9.7	(6.1)	10.0	(6.2)	10.2	(6.4)
R6	-	11.7	(7.3)	12.1	(7.5)	12.3	(7.7)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (17 x 6) or 40 Km/h Transmission (18 x 6)

TM135 and TM150 only

Gear Ratio	Range	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios									
F1	A	2.4	(1.5)	2.4	(1.5)	2.5	(1.5)	2.5	(1.6)
F2	A	2.8	(1.8)	2.9	(1.8)	3.0	(1.8)	3.0	(1.9)
F3	A	3.4	(2.1)	3.5	(2.2)	3.6	(2.2)	3.6	(2.3)
F4	A	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)	4.4	(2.7)
F5	A	4.9	(3.1)	5.0	(3.1)	5.2	(3.2)	5.2	(3.3)
F6	A	5.9	(3.7)	6.1	(3.8)	6.2	(3.9)	6.3	(3.9)
F1	B	5.5	(3.4)	5.6	(3.5)	5.7	(3.6)	5.8	(3.6)
F2	B	6.6	(4.1)	6.7	(4.2)	6.9	(4.3)	7.0	(4.4)
F3	B	7.9	(4.9)	8.1	(5.0)	8.3	(5.1)	8.4	(5.2)
F4	B	9.5	(5.9)	9.7	(6.0)	9.9	(6.2)	10.1	(6.3)
F5	B	11.5	(7.1)	11.7	(7.3)	12.0	(7.4)	12.2	(7.6)
F6	B	13.8	(8.6)	14.1	(8.7)	14.4	(8.9)	14.6	(9.1)
F1	C	15.6	(9.7)	15.9	(9.9)	16.2	(10.1)	16.5	(10.3)
F2	C	18.7	(11.6)	19.1	(11.9)	19.5	(12.1)	19.9	(12.4)
F3	C	22.5	(14.0)	22.9	(14.3)	23.5	(14.6)	23.9	(14.8)
F4	C	27.1	(16.8)	27.6	(17.1)	28.2	(17.5)	28.7	(17.8)
F5	C	32.5	(20.2)	33.2	(20.6)	33.9	(21.1)	34.5	(21.5)
F6	C	39.1	(24.3)	39.9	(24.8)	40.8	(25.4)	41.5	(25.8)
NOTE: *Ratio F6 in C range is not available on 30 Km/h transmissions.*									
Reverse Ratios									
R1	-	4.6	(2.9)	4.7	(2.9)	4.8	(3.0)	4.9	(3.0)
R2	-	5.6	(3.5)	5.7	(3.5)	5.8	(3.6)	5.9	(3.7)
R3	-	6.7	(4.1)	6.8	(4.2)	7.0	(4.3)	7.1	(4.4)
R4	-	8.0	(5.0)	8.2	(5.1)	8.4	(5.2)	8.5	(5.3)
R5	-	9.6	(6.0)	9.8	(6.1)	10.1	(6.2)	10.2	(6.4)
R6	-	11.6	(7.2)	11.8	(7.3)	12.1	(7.5)	12.3	(7.6)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2300 rev/min) with 30 Km/h Transmission (17 x 6) or 40 Km/h Transmission (18 x 6)

TM165 only

Gear Ratio	Range	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios									
F1	A	2.1	(1.3)	2.2	(1.3)	2.2	(1.4)	2.3	(1.4)
F2	A	2.6	(1.6)	2.6	(1.6)	2.7	(1.7)	2.7	(1.7)
F3	A	3.0	(1.9)	3.1	(1.9)	3.2	(2.0)	3.3	(2.0)
F4	A	3.7	(2.3)	3.8	(2.3)	3.8	(2.4)	3.9	(2.4)
F5	A	4.4	(2.8)	4.5	(2.8)	4.6	(2.9)	4.7	(2.9)
F6	A	5.3	(3.3)	5.4	(3.4)	5.6	(3.5)	5.7	(3.5)
F1	B	4.9	(3.1)	5.0	(3.1)	5.1	(3.2)	5.2	(3.3)
F2	B	5.9	(3.7)	6.0	(3.8)	6.2	(3.9)	6.3	(3.9)
F3	B	7.1	(4.4)	7.3	(4.5)	7.4	(4.6)	7.6	(4.7)
F4	B	8.6	(5.3)	8.7	(5.4)	8.9	(5.5)	9.1	(5.6)
F5	B	10.3	(6.4)	10.5	(6.5)	10.7	(6.7)	10.9	(6.8)
F6	B	12.4	(7.7)	12.6	(7.8)	12.9	(8.0)	13.1	(8.2)
F1	C	14.0	(8.7)	14.2	(8.9)	14.6	(19.1)	14.8	(9.2)
F2	C	16.8	(10.4)	17.1	(10.6)	17.5	(10.9)	17.8	(11.1)
F3	C	20.2	(12.5)	20.6	(12.8)	21.0	(13.1)	21.4	(13.3)
F4	C	24.3	(15.1)	24.7	(15.4)	25.3	(15.7)	25.7	(16.0)
F5	C	29.2	(18.1)	29.8	(18.5)	30.4	(18.9)	31.0	(19.2)
F6	C	35.1	(21.8)	35.8	(22.2)	36.6	(22.7)	37.2	(23.1)
NOTE: *Ratio F6 in C range is not available on 30 Km/h transmissions.*									
Reverse Ratios									
R1	-	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)	4.4	(2.7)
R2	-	5.0	(3.1)	5.1	(3.2)	5.2	(3.2)	5.3	(3.3)
R3	-	6.0	(3.7)	6.1	(3.8)	6.2	(3.9)	6.3	(3.9)
R4	-	7.2	(4.5)	7.3	(4.6)	7.5	(4.7)	7.6	(4.7)
R5	-	8.6	(5.4)	8.8	(5.5)	9.0	(5.6)	9.2	(5.7)
R6		10.4	(6.5)	10.6	(6.6)	10.8	(6.7)	11.0	(6.9)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) using optional Creeper Gears

TM115 and TM125 only

Gear Ratio	Range	Rear Tyre Size 16.9-38 16.9R-38 480/70R-38		Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46	
Forward Ratios							
F1	**A**	0.40	(0.25)	0.41	(0.25)	0.42	(0.26)
F2	**A**	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F3	**A**	0.58	(0.36)	0.59	(0.37)	0.61	(0.38)
F4	**A**	0.69	(0.43)	0.71	(0.44)	0.73	(0.45)
F5	**A**	0.83	(0.52)	0.86	(0.53)	0.87	(0.54)
F6	**A**	0.92	(0.57)	0.95	(0.59)	0.97	(0.60)
F1	**B**	1.11	(0.69)	1.15	(0.71)	1.17	(0.73)
F2	**B**	1.34	(0.83)	1.38	(0.86)	1.40	(0.87)
F3	**B**	1.61	(1.00)	1.66	(1.03)	1.69	(1.05)
F4	**B**	1.93	(1.20)	1.99	(1.24)	2.03	(1.26)
F5	**B**	2.62	(1.63)	2.70	(1.68)	2.76	(1.71)
F6	**B**	3.15	(1.96)	3.25	(2.02)	3.32	(2.06)
F1	**C**	3.79	(2.35)	1.91	(2.43)	3.98	(2.47)
Reverse Ratios							
R1	**-**	0.78	(0.48)	0.80	(0.50)	0.82	(0.51)
R2	**-**	0.93	(0.58)	0.96	(0.60)	0.98	(0.61)
R3	**-**	1.12	(0.70)	1.16	(0.72)	1.18	(0.73)
R4	**-**	1.35	(0.84)	1.39	(0.86)	1.42	(0.88)
R5	**-**	1.62	(1.01)	1.67	(1.04)	1.71	(1.06)
R6	**-**	1.95	(1.21)	2.01	(1.25)	2.05	(1.27)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) using optional Creeper Gears

TM135 and TM150 only

Gear Ratio	Range	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios									
F1	A	0.39	(0.25)	0.40	(0.25)	0.41	(0.26)	0.42	(0.26)
F2	A	0.47	(0.30)	0.48	(0.30)	0.49	(0.31)	0.50	(0.31)
F3	A	0.57	(0.35)	0.58	(0.36)	0.59	(0.37)	0.60	(0.38)
F4	A	0.68	(0.43)	0.70	(0.43)	0.71	(0.44)	0.73	(0.45)
F5	A	0.82	(0.51)	0.84	(0.52)	0.86	(0.53)	0.87	(0.54)
F6	A	0.99	(0.62)	1.01	(0.63)	1.03	(0.64)	1.05	(0.65)
F1	B	0.92	(0.57)	0.93	(0.58)	0.95	(0.59)	0.97	(0.60)
F2	B	1.10	(0.68)	1.12	(0.70)	1.15	(0.71)	1.17	(0.73)
F3	B	1.32	(0.82)	1.35	(0.84)	1.38	(0.86)	1.40	(0.87)
F4	B	1.59	(0.99)	1.62	(1.01)	1.66	(1.03)	1.69	(1.05)
F5	B	1.91	(1.19)	1.95	(1.21)	1.99	(1.24)	2.03	(1.26)
F6	B	2.30	(1.43)	2.34	(1.46)	2.40	(1.49)	2.44	(1.52)
F1	C	2.60	(1.61)	2.65	(1.64)	2.71	(1.68)	2.75	(1.71)
Reverse Ratios									
R1	-	0.77	(0.48)	0.78	(0.49)	0.80	(0.50)	0.82	(0.51)
R2	-	0.92	(0.57)	0.94	(0.59)	0.96	(0.60)	0.98	(0.61)
R3	-	1.11	(0.69)	1.13	(0.70)	1.16	(0.72)	1.18	(0.73)
R4	-	1.34	(0.83)	1.36	(0.85)	1.39	(0.87)	1.42	(0.88)
R5	-	1.61	(1.00)	1.64	(1.02)	1.67	(1.04)	1.70	(1.06)
R6	-	1.93	(1.20)	1.97	(1.22)	2.01	(1.25)	2.05	(1.27)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2300 rev/min) using optional Creeper Gears

TM165 only

Gear Ratio	Range	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios									
F1	A	0.35	(0.22)	0.36	(0.22)	0.37	(0.23)	0.38	(0.23)
F2	A	0.43	(0.26)	0.43	(0.27)	0.44	(0.28)	0.45	(0.28)
F3	A	0.51	(0.32)	0.52	(0.32)	0.53	(0.33)	0.54	(0.34)
F4	A	0.61	(0.38)	0.63	(0.39)	0.64	(0.40)	0.65	(0.41)
F5	A	0.74	(0.46)	0.75	(0.47)	0.77	(0.48)	0.78	(0.49)
F6	A	0.89	(0.55)	0.91	(0.56)	0.93	(0.58)	0.94	(0.59)
F1	B	0.82	(0.51)	0.84	(0.52)	0.86	(0.53)	0.87	(0.54)
F2	B	0.99	(0.61)	1.01	(0.63)	1.03	(0.64)	1.05	(0.65)
F3	B	1.19	(0.74)	1.21	(0.75)	1.24	(0.77)	1.26	(0.78)
F4	B	1.43	(0.89)	1.45	(1.90)	1.49	(0.92)	1.51	(1.94)
F5	B	1.71	(1.07)	1.75	(1.09)	1.79	(1.11)	1.82	(1.13)
F6	B	2.06	(1.28)	2.10	(1.31)	2.15	(1.34)	2.19	(1.36)
F1	C	2.33	(1.45)	2.37	(1.47)	2.43	(1.51)	2.47	(1.54)
Reverse Ratios									
R1	-	0.69	(0.43)	0.70	(0.44)	0.72	(0.45)	0.73	(0.45)
R2	-	0.83	(0.52)	0.85	(0.53)	0.86	(0.54)	0.88	(0.55)
R3	-	1.00	(0.62)	1.02	(0.63)	1.04	(0.65)	1.06	(0.66)
R4	-	1.20	(0.74)	1.22	(0.76)	1.25	(0.78)	1.27	(0.79)
R5	-	1.44	(0.90)	1.47	(0.91)	1.50	(0.93)	1.53	(0.95)
R6	-	1.73	(1.08)	1.77	(1.10)	1.81	(1.12)	1.84	(1.14)

POWER COMMAND™ TRANSMISSION (TM150 and TM165 only)

Power Command is a full powershift transmission of an advanced design.

Subject to legal requirements in your country, the following transmissions are available

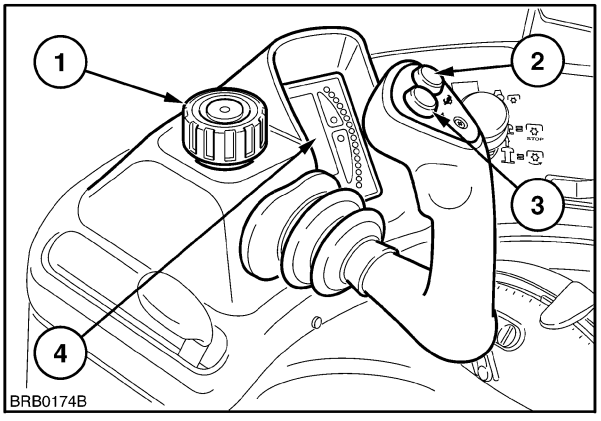
40 km/h transmission	18 forward and 6 reverse ratios plus optional 10 x 6 creeper range.
30 km/h transmission	17 forward and 6 reverse ratios (18th. gear cannot be selected) plus optional 10 x 6 creeper range.

Details of creeper gear operation will be found on page 2-95.

IMPORTANT: *A tractor fitted with Power Command transmission cannot be tow-started and must* ***not*** *be towed other than to remove it from a field or onto a trailer or truck.*

Powershift Control - Figure 145

Power Command transmission is operated by means of a powershift control incorporating two push buttons. The buttons are used to make upward or downward gear changes on the move, even when performing operations such as ploughing, etc.



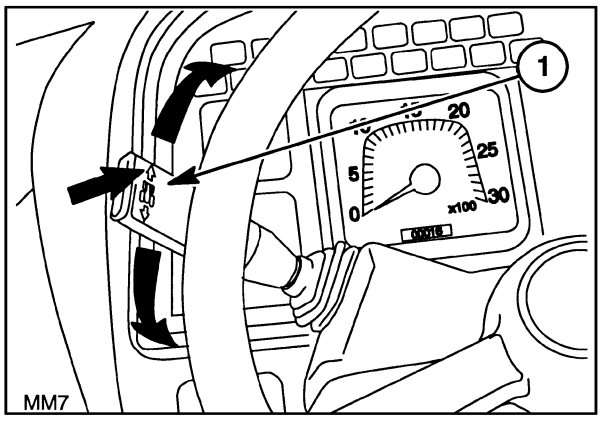
145

Any one of 17 or 18 gear ratios may be sequentially selected using the upshift button (2) or downshift button (3). A digital display (4) and LED's next to the powershift control indicate the gear ratio selected. It is not necessary to depress the clutch pedal when using the upshift or downshift buttons.

The powershift control may be repositioned to suit the operator. Loosen the clamp knob (1), move the control to the most comfortable position then tighten the knob to clamp it in the new position.

Shuttle Lever - Figure 146

Selection of forward or reverse travel is by means of the shuttle lever (1), located to the left of the steering wheel, is used to select forward or reverse travel. The lever is spring-loaded to prevent inadvertent movement. It is not necessary to depress the clutch pedal when actuating the shuttle lever.



146

NOTE: *If the shuttle lever is moved to the forward or reverse position with the handbrake engaged, an audible alarm will be heard. Additionally, forward or reverse drive cannot be engaged unless the operator is in the tractor seat and either:-*
The clutch pedal is depressed and released with the F-N-R lever in the neutral position.
OR
The handbrake is released with the F-N-R lever in the neutral position.

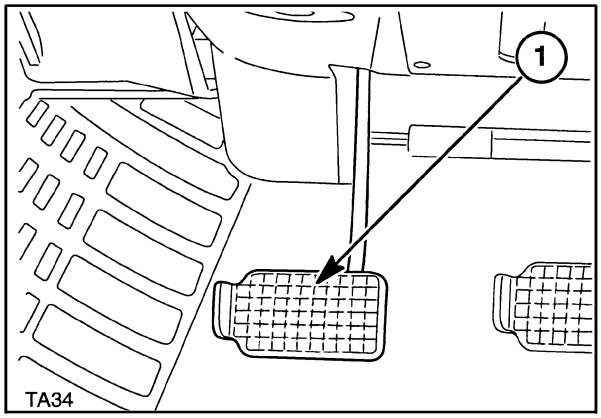
⚠ WARNING ⚠

To prevent inadvertent tractor movement, always stop the engine, place the shuttle lever in neutral and firmly apply the parking brake before leaving the tractor. The transmission will not prevent the tractor from rolling when the engine is shut off.

NOTE: *When operating in temperatures below -18° C (0° F) with cold transmission oil, avoid shuttle operations, as far as practicable, until the oil has warmed up.*

Clutch Pedal - Figure 147

A clutch pedal (1) is provided but is not required for gear changes or forward/reverse shuttle operations.



147

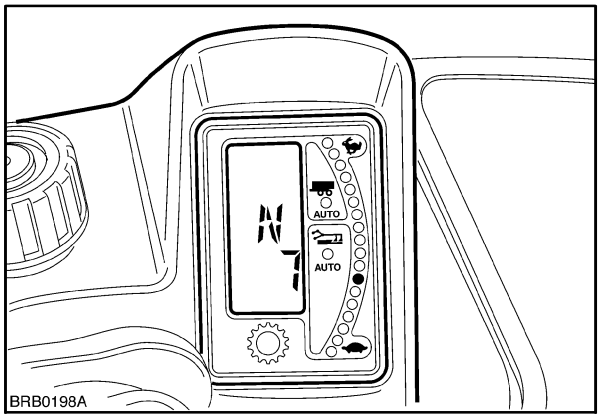
The clutch pedal is required only for positioning the tractor to attach equipment or if operating in confined spaces when the low ratios do not provide a slow enough speed, at moderate/low engine speeds, to give precise control.

IMPORTANT: *To avoid premature wear, do not use the clutch pedal as a footrest.*

Driving the Tractor - Figure 148

Start the engine with the shuttle lever in neutral and the clutch pedal depressed. The LCD on the instrument panel and adjacent to the Powershift control will display 'N' (for neutral) and '7'. (When the tractor is initially started, the electronic control will automatically select 7th. gear).

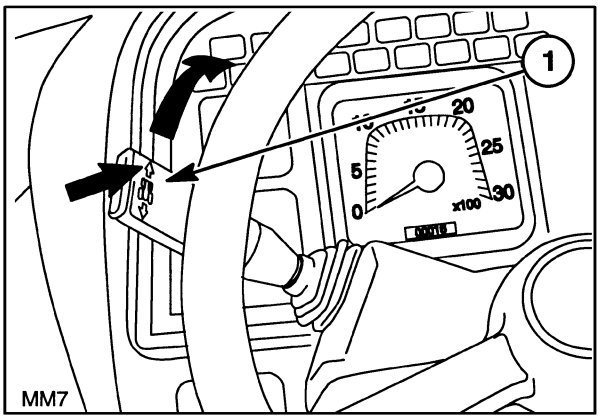
NOTE: *Neutral start switches prevent operation of the starting motor unless the shuttle lever is in neutral and the clutch pedal depressed.*



148

Figure 149

For forward travel, with the engine idling, pull the shuttle lever (1) toward the steering wheel, against light spring-pressure, and move it up.

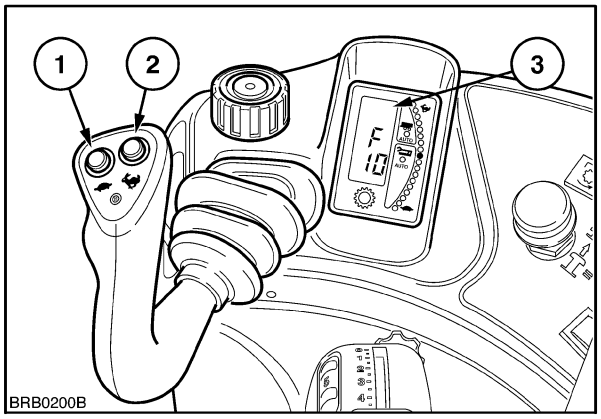


149

Figure 150

Once moving, select the required ratio with the upshift button (2) or downshift button (1), as previously described. An example of the display that you will see is shown at (3), where 'F' indicates forward and '10' indicates that 10th. gear is selected. The LED for 10th. gear will also be illuminated.

NOTE: *An alternative lower or higher ratio may be preselected* ***before*** *pulling away. However, if a ratio higher than 12 is selected then the electronic control will select 12, this being the highest ratio permissible when pulling away from a standstill. If, for example, 15th. gear is selected before pulling away, the 15th. gear LED will flash and the 12th. gear LED will be steady. The tractor will pull away in 12th. gear and change up, sequentially, to the selected gear as engine load, engine speed and road speed are optimised. The LED's for 13th. and 14th. gear will illuminate, as these ratios are automatically selected, then the 15th. gear LED will stop flashing and become steady as that gear is reached.*

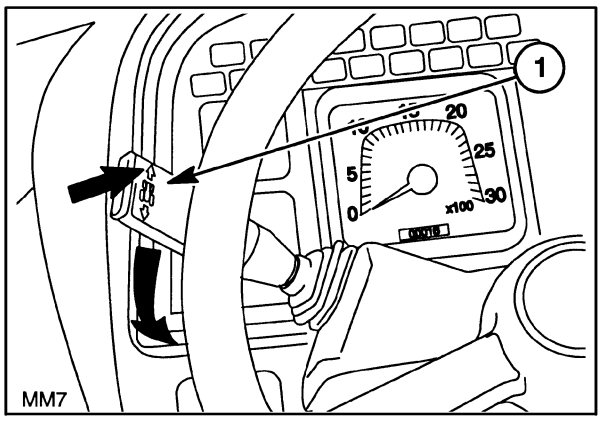


150

Figure 151

To reverse the direction of travel, reduce engine speed, pull the shuttle lever (1) toward the steering wheel, then move it down.

NOTE: *When changing from forward to reverse travel, the nearest available ratio will be selected. As only six ratios are available in reverse, the ground speed in reverse gear may be different to the speed in the selected forward gear. For example, if F15 is selected in forward travel, then the nearest reverse ratio, R6, will be selected when the shuttle lever is moved to the reverse travel position.*

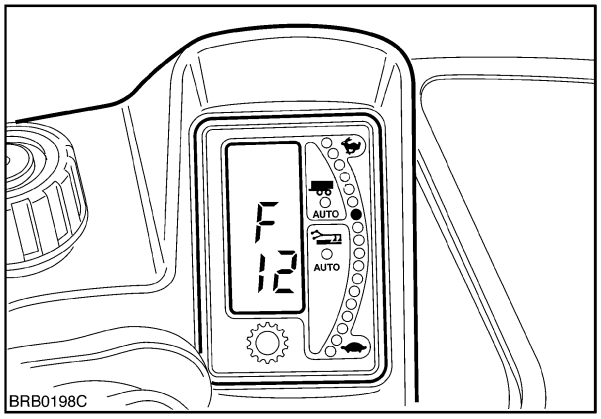


151

Figure 152

When performing shuttle operations in a high gear, for example forward F15 selected, when the shuttle lever is moved to the reverse position, the transmission will select the highest available ratio in reverse (R6).

When the shuttle lever is moved forward again, ratio (F12) will be selected and the F12 LED will glow.

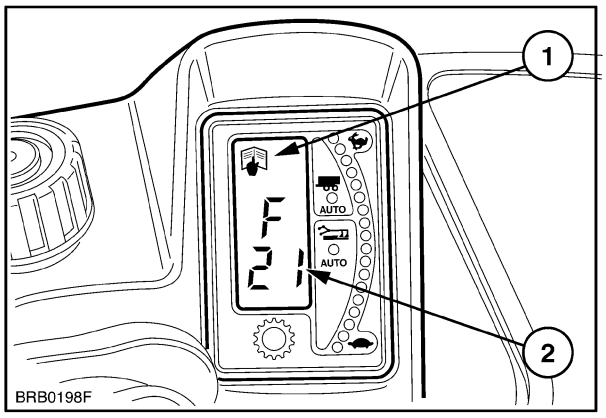


152

Figure 153

In the unlikely event of a fault occurring in the electronic transmission circuitry, the malfunction symbol (1) or warning light and a two-digit error code (2), preceded by the letter 'F' will flash in the transmission ratio display.

The code indicates the faulty circuit or sensor and the type of fault, e.g., open circuit, short circuit, etc. In this event, the tractor will require the attention of your authorised dealer.



153

Auto Shift Function

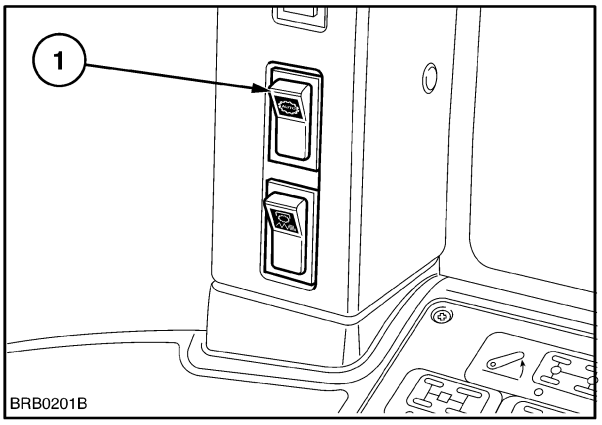
Engaging the auto shift mode permits automatic gear changing in the forward ratios. Two automatic ranges are available:

Road range - ratios 12 - 17 (30 km/h transmission)
or 12 - 18 (40 km/h transmission)

Field range - ratios 1 - 11

Auto Shifting in Road Range – Figure 154

While travelling forward in 12th. gear or higher, press and release the AUTO switch (1) on the right-hand 'B' pillar.

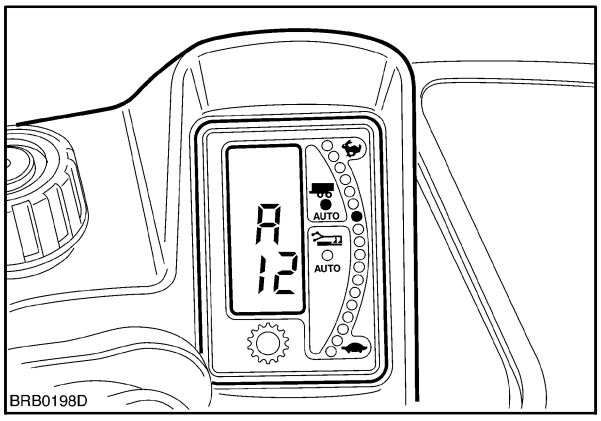


154

Figure 155

The gear ratio currently selected will already be displayed and the appropriate LED illuminated. When AUTO shift is engaged an 'A' will appear in the LCD display.

When in AUTO shift, the tractor will automatically select lower or higher gears, within the range of 12 to 18, as dictated by engine torque and speed, and the use of brakes and foot throttle.

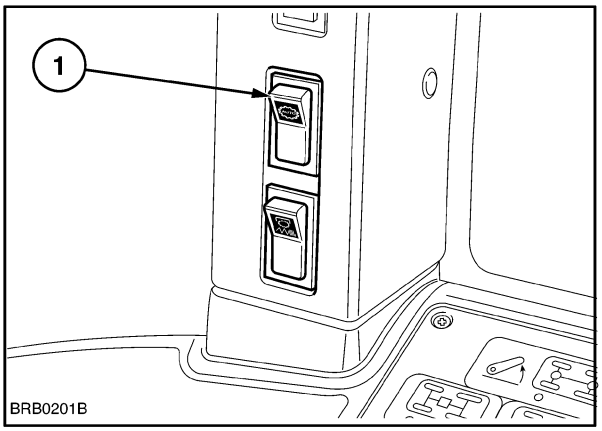


155

Figure 156

To disengage AUTO shift and return to normal shifting, press and release the AUTO switch (1).

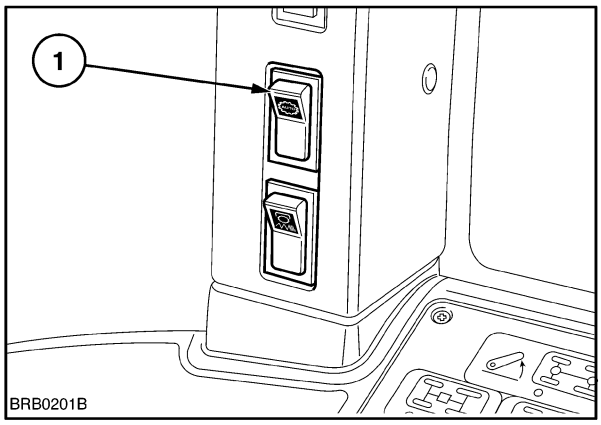
Alternatively, the auto mode may be cancelled by pressing either of the up/down buttons or by using the shuttle lever to select reverse.



156

Auto Shifting in Field Range - Figure 157

While travelling or operating in any forward gear between 1 and 11, press and release the AUTO switch (1) on the right-hand 'B' pillar. The transmission will make automatic shifts within a span of 5 gears.



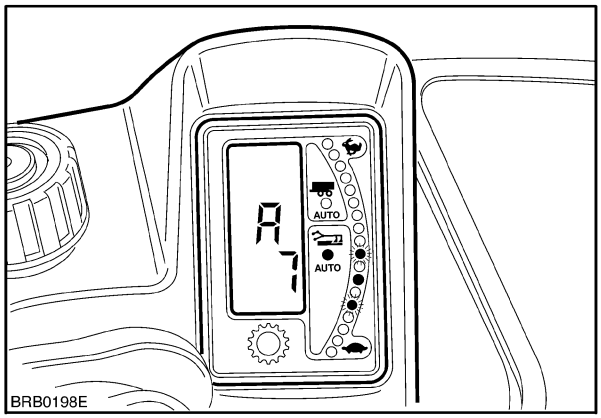
157

Figure 158

The gear ratio currently selected will already be displayed and the appropriate LED illuminated. When AUTO shift is engaged an 'A' will appear in the LCD display.

When in AUTO shift, the system will automatically set an operating range of plus or minus two gears from that currently selected. Automatic changes will occur within this range, dependent upon load and speed.

Example: While operating in 7th. gear, '7' is displayed and the 7th. gear LED is illuminated. If the AUTO switch is pressed, the LED's for 5th. and 9th. gear will flash to indicate that automatic changing will occur between 5th. and 9th. gears.



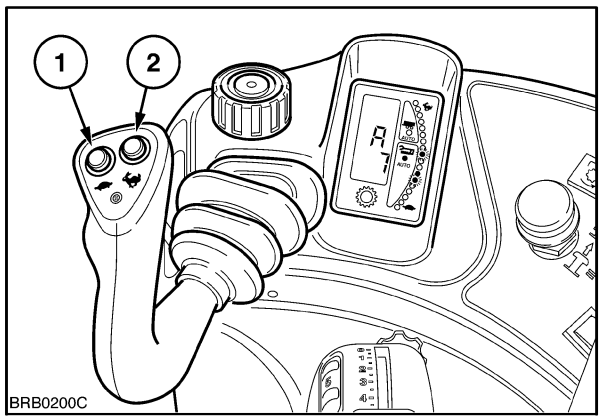
158

Changing the Gear Span - Figure 159

The range of plus or minus two gears may be expanded both up and down on the move, using the downshift and upshift buttons (1) and (2).

Example 1 Upshifting: When operating in AUTO mode in 7th. gear, as described above, the LED's for 5th. and 9th. gear will flash. On reaching 9th gear press the upshift button (2) once to select 10th gear. When the tractor has upshifted to 10th, press the button again to select 11th gear. AUTO shifting will now be provided between 5th and 11th gears. The LED for 5th will continue to flash identifying the lowest automatic gear selected.

Example 2 Downshifting: Assuming 5th has been selected as the lowest AUTO ratio, slow the tractor until this gear has been engaged. Then, using the downshift button (1), select 4th gear and further reduce speed until 4th gear engages. 3rd gear may now be selected if required. Applying this technique it is possible to select gears 1 to 11 in the AUTO range.

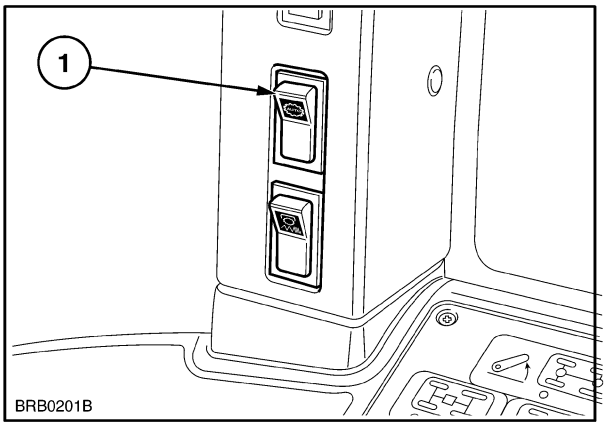


159

Go To Mode

An additional feature on your tractor is the ‘Go To’ mode. The ’Go To’ system can be programmed to downshift to a lower gear below that of the working gear whenever the implement is raised. This feature can be further enhanced by selecting the field AUTO shift function whereby the tractor will also automatically upshift again on lowering the implement.

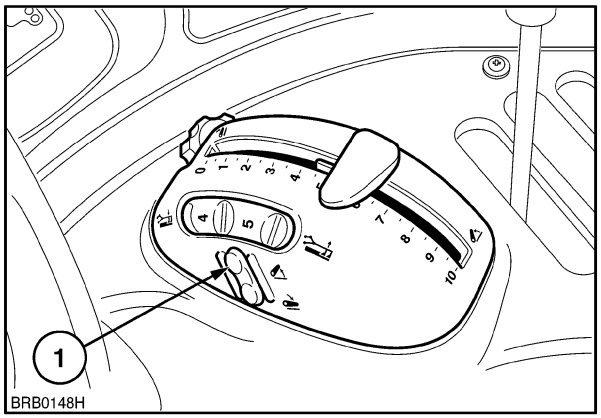
To programme ’Go To’ mode, proceed as follows.



160

Figure 160

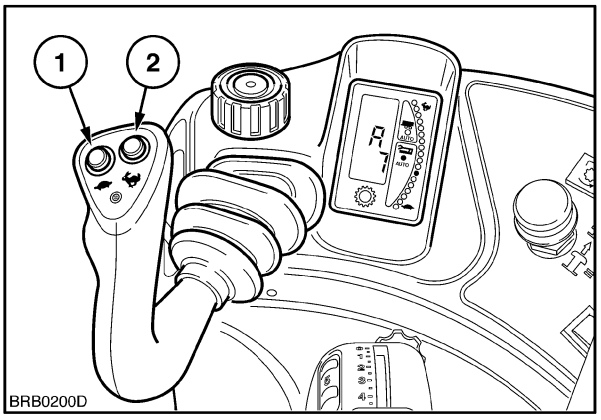
Press and hold the AUTO function switch (1) on the ‘B’ pillar.



161

Figure 161

With the engine running, press and release the top of the fast raise switch (1) to raise the implement. The auto field LED will illuminate on the transmission display. Continue to hold in the AUTO function switch.



162

Figure 162

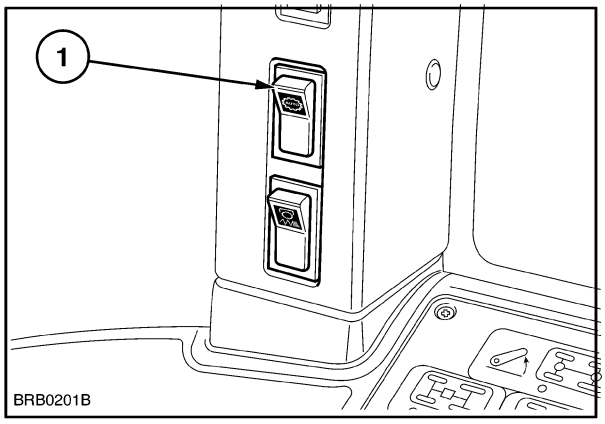
With the AUTO function switch still depressed, select the required ‘Go To’ gear using the upshift button (2) or downshift button (1). The LED for the’Go To’ gear selected will flash. Release the AUTO switch. Lower the implement by pressing and releasing the fast raise switch.

NOTE: *Auto shift in the field range is disengaged every time the implement is raised and re-engaged when it is lowered.*

Figure 163

To disengage 'Go To' mode and return to normal shifting, press and hold the AUTO switch (1). Move the fast raise switch (1) Figure 162, to raise or lower the implement.

NOTE: *With AUTO shift selected in conjunction with the 'Go To' mode, the lowest gear in the AUTO function becomes the 'Go To' gear.*



163

Speed Matching

When travelling on the road in the road range (ratios 12-18) the transmission is able to automatically match engine speed to road speed by either depressing the clutch pedal, **or,** by momentarily selecting the neutral position on the shuttle lever.

The current gear, if higher than the speed matched gear, will be stored as the 'target' gear identified by its flashing LED.

Programming Reverse Gear Ratios

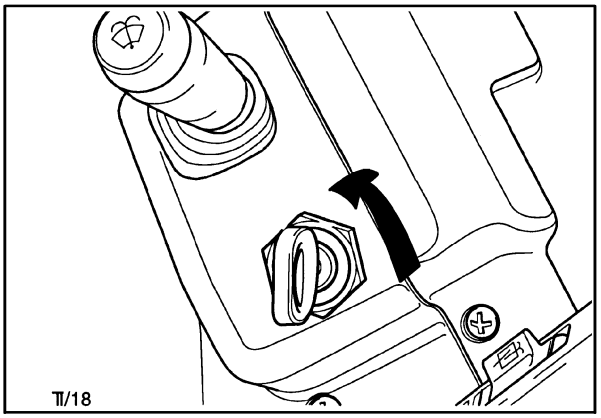
When changing from forward to reverse, the transmission will normally select the same ratio in reverse as was selected for forward travel.

For special shuttle shift applications, Power Command transmission offers the advantage of automatically changing the reverse gear ratio up to three ratios higher or lower than the currently engaged forward gear ratio.

To programme an alternative reverse gear, proceed as follows:

Figure 164

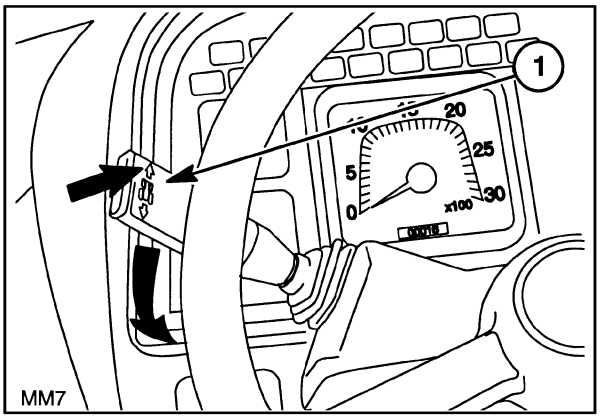
- Turn the key-start switch off.



164

Figure 165

- Move the shuttle lever (1) to the reverse gear position.



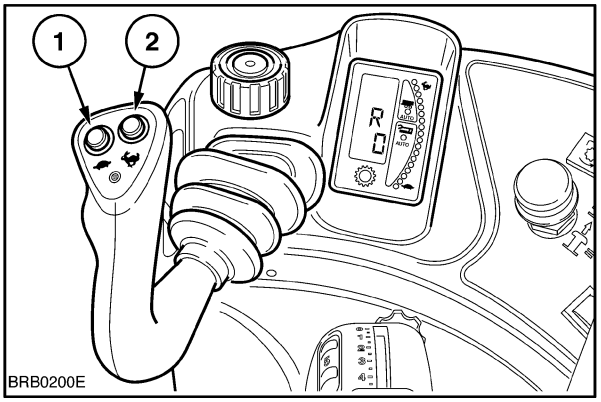
165

Figure 166

- Press and hold down the upshift button (2).

- While holding down the upshift button, turn on the key-start switch (but do not start the engine). The digital display should show 'R0' (unless the transmission has previously been programmed to select a higher or lower reverse gear.)

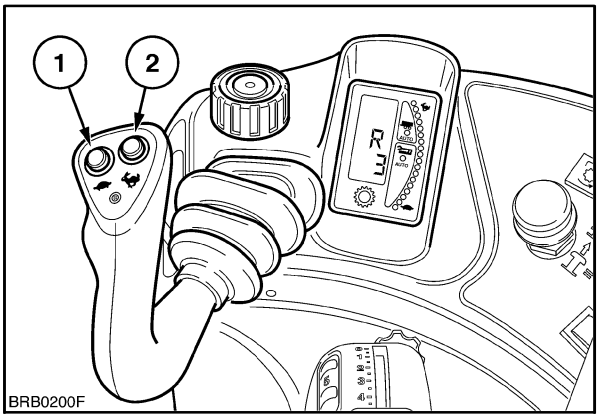
- Release the upshift button. The transmission is now in the programming mode.



166

To programme a higher reverse ratio - Figure 167:

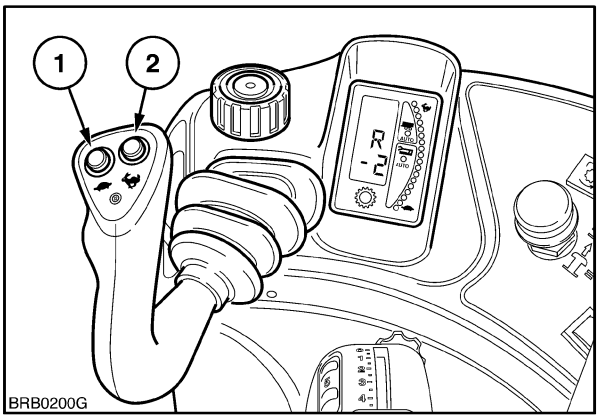
- Press the upshift button (2) one, two or three times, as required. The display will show 'R1', 'R2' or 'R3'. This indicates that when reverse is selected the gear will be one, two or three ratios higher than the forward gear ratio.



167

To programme a lower reverse ratio - Figure 168:

- Press the downshift button (1) one, two or three times, as required. The display will show 'R-1', 'R-2' or 'R-3'. This indicates that when reverse is selected the gear will be one, two or three ratios lower than the forward gear ratio.



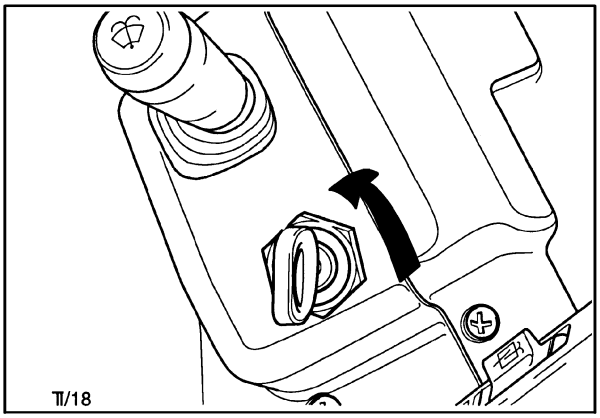
168

To exit the programme - Figure 169:

- Turn the key-start switch off. The transmission is now programmed.

NOTE: *Remember that only six reverse gears are available. Consequently, if travelling forward in ratios F13 - 18, the transmission will always behave as if ratio F12 (the highest ratio in the field range) is selected. Therefore, if the transmission has been programmed to select 2 ratios lower in reverse, then R4 will be selected.*

Conversely, if travelling forward in ratios F1 - 6, the transmission will always behave as if ratio 7 is selected. Therefore, if the transmission has been programmed to select 2 ratios higher in reverse, then R3 will be selected.



169

CREEPER GEARS (where fitted)

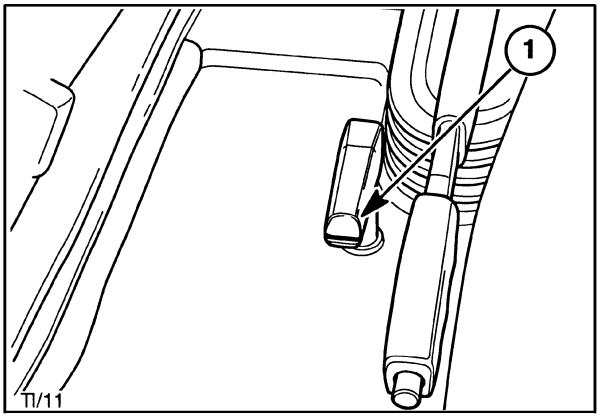
For operations requiring extra low ground speeds, a reduction gear set (creeper gears) is available. The reduction gear set is installed within the main transmission housing and has a reduction ratio of 6:1.

With the reduction gears, an additional 10 forward and 6 reverse creeper gear ratios are provided. The reduction gear set has the effect of reducing the ratios within the main transmission to provide very low operating speeds.

Creeper gear selection - Figure 170

To select the creeper gears, with the engine running and the tractor stationary, engage the required ratio/range using the powershift control. See previous text. Pull the creeper gears selector (1) up to engage the creeper range and push down to disengage. Creeper gear selection is denoted by a 'snail' symbol in the top, right-hand corner of the transmission display adjacent to the gear levers.

When using the creeper gears only 10 ratios are available. See the road speed chart on page 2-99 for available ratios.

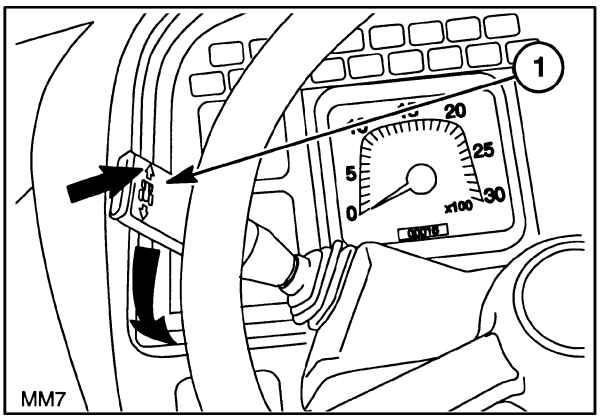


170

Figure 171

To reverse the direction of travel, reduce engine speed, pull the shuttle lever (1) toward the steering wheel, then move it down.

IMPORTANT: *Creeper gears offer very low ground speeds. Do* ***not*** *use the low gearing advantage to apply excessive draft loads to the tractor. Do* ***not*** *use creeper gears in the high range for operations requiring full engine power.*



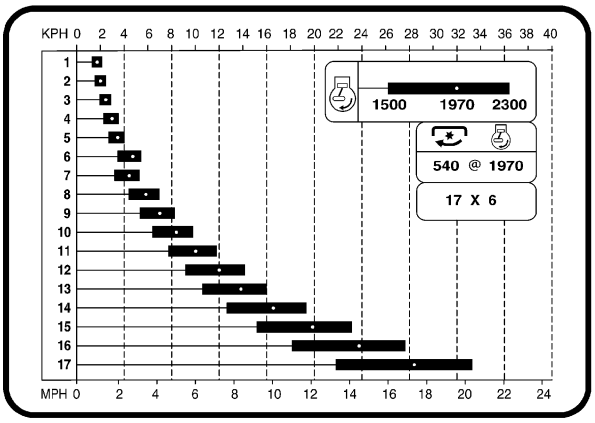
171

GROUND SPEED DECALS

Decals similar to those shown are affixed to the lower, front corner of the right-hand window. The upper decal is for 30 km/h transmissions, the lower decal for 40 km/h transmissions.

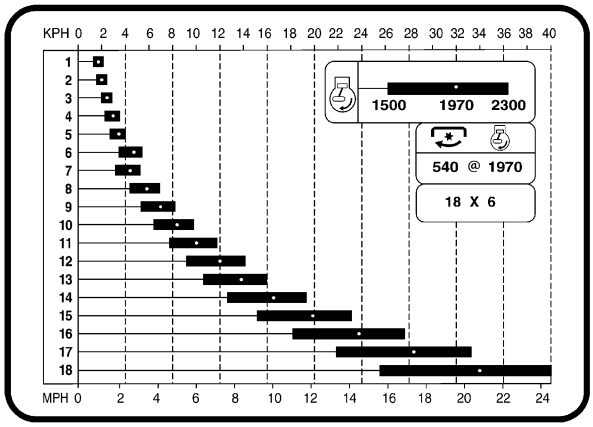
The left-hand side of each decal shows the number of gear speeds. The main area of the decal contains a number of black blocks representing the ground speeds available in each of the gear ratios at three alternative engine speeds.

The left edge of each block represents an engine speed of 1500 rev/min. and the right-hand edge, the rated speed (2300 rev/min). A white dot in the centre of each block depicts the engine speed at which the 540 rev/min. P.T.O. speed of is obtained (1970 rev.min).



172

Example: 30 km/h Decal - Figure 172
To find the ground speed at 1500 engine rev/min. in 14th gear, follow the left-hand edge of the block, up to the KPH line or down to the MPH line. In the example shown, the ground speed indicated is 12.7 km/h or 7.8 MPH.



173

Example: 40 km/h Decal - Figure 173
To find the ground speed at 2300 engine rev/min. in 16th gear follow the right-hand edge of the block, up to the KPH line or down to the MPH line. In the example shown, the ground speed indicated is 27.8 km/h or 17.2 MPH.

Ground Speed Charts

The ground speed of your tractor may be displayed on the instrument panel. If your tractor is equipped with radar then the ground speed displayed will be a true reading. Tractors without radar will display a ground speed that is subject to minor inaccuracies due to the effects of wheel slip, tyre pressures, change of tyre size, etc.

The charts on the following pages show the ground speeds in km/h and MPH. To find the road speed for your tractor in any given gear ratio, use the column with your rear tyre size in the heading.

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2200 rev/min) with 30 Km/h Transmission (17 x 6) or 40 Km/h Transmission (18 x 6)

TM150 only

Gear Ratio	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios								
F1	1.9	(1.2)	1.9	(1.2)	1.9	(1.2)	2.0	(1.2)
F2	2.2	(1.4)	2.3	(1.4)	2.3	(1.5)	2.4	(1.5)
F3	2.7	(1.7)	2.7	(1.7)	2.8	(1.7)	2.9	(1.8)
F4	3.2	(2.0)	3.3	(2.0)	3.4	(2.1)	3.4	(2.1)
F5	3.9	(2.4)	4.0	(2.5)	4.1	(2.5)	4.1	(2.6)
F6	4.7	(2.9)	4.8	(3.0)	4.9	(3.0)	5.0	(3.1)
F7	5.4	(3.4)	5.5	(3.4)	5.6	(3.5)	5.7	(3.6)
F8	6.5	(4.0)	6.6	(4.1)	6.8	(4.2)	6.9	(4.3)
F9	7.8	(4.8)	7.9	(4.9)	8.1	(5.1)	8.3	(5.1)
F10	9.4	(5.8)	9.6	(5.9)	9.8	(6.1)	9.9	(6.2)
F11	11.3	(7.0)	11.5	(7.1)	11.8	(7.3)	12.0	(7.4)
F12	13.6	(8.4)	13.8	(8.6)	14.1	(8.8)	14.4	(8.9)
F13	15.6	(9.7)	15.9	(9.9)	16.2	(10.1)	16.5	(10.3)
F14	18.7	(11.6)	19.1	(11.9)	19.5	(12.1)	19.9	(12.4)
F15	22.5	(14.0)	22.9	(14.3)	23.5	(14.6)	23.9	(14.8)
F16	27.1	(16.8)	27.6	(17.1)	28.2	(17.5)	28.7	(17.8)
F17	32.5	(20.2)	33.2	(20.6)	33.9	(21.1)	34.5	(21.5)
F18	39.1	(24.3)	39.9	(24.8)	40.8	(25.4)	41.5	(25.8)
NOTE: *Ratio F18 range is only available on 40 Km/h transmissions.*								
Reverse Ratios								
R1	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)	4.4	(2.7)
R2	5.0	(3.1)	5.0	(3.1)	5.2	(3.2)	5.3	(3.3)
R3	5.9	(3.7)	6.1	(3.8)	6.2	(3.9)	6.3	(3.9)
R4	7.2	(4.4)	7.3	(4.5)	7.5	(4.6)	7.6	(4.7)
R5	8.6	(5.3)	8.8	(5.4)	9.0	(5.6)	9.1	(5.7)
R6	10.4	(6.4)	10.5	(6.6)	10.8	(6.7)	11.0	(6.8)

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed (2300 rev/min) with 30 Km/h Transmission (17 x 6) or 40 Km/h Transmission (18 x 6)

TM165 only

Gear Ratio	Rear Tyre Size 18.4-38 18.4R-38 520/70R-38 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38 20.8R-38 580/70R-38 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios								
F1	1.8	(1.1)	1.9	(1.2)	1.9	(1.2)	2.0	(1.2)
F2	2.2	(1.4)	2.3	(1.4)	2.3	(1.4)	2.3	(1.5)
F3	2.7	(1.7)	2.7	(1.7)	2.8	(1.7)	2.8	(1.8)
F4	3.2	(2.0)	3.3	(2.0)	3.3	(2.1)	3.4	(2.1)
F5	3.8	(2.4)	3.9	(2.4)	4.0	(2.5)	4.1	(2.5)
F6	4.6	(2.9)	4.7	(2.9)	4.8	(3.0)	4.9	(3.0)
F7	5.3	(3.3)	5.4	(3.4)	5.6	(3.5)	5.6	(3.5)
F8	6.4	(4.0)	6.5	(4.1)	6.7	(4.2)	6.8	(4.2)
F9	7.7	(4.8)	7.8	(4.9)	8.0	(5.0)	8.2	(5.1)
F10	9.2	(5.7)	9.4	(5.9)	9.6	(6.0)	9.8	(6.1)
F11	11.1	(6.9)	11.3	(7.0)	11.6	(7.2)	11.8	(7.3)
F12	13.4	(8.3)	13.6	(8.5)	13.9	(8.7)	14.2	(8.8)
F13	15.4	(9.6)	15.7	(9.7)	16.0	(10.0)	16.3	(10.1)
F14	18.5	(11.5)	18.8	(11.7)	19.3	(12.0)	19.6	(12.2)
F15	22.2	(13.8)	22.6	(14.1)	23.1	(14.4)	23.5	(14.6)
F16	26.7	(16.6)	27.2	(16.9)	27.8	(17.3)	28.3	(17.6)
F17	32.1	(19.9)	32.7	(20.3)	33.5	(20.8)	34.1	(21.2)
F18	38.6	(24.0)	39.4	(24.5)	40.2	(25.0)	41.0	(25.5)
Reverse Ratios								
R1	4.1	(2.5)	4.1	(2.6)	4.2	(2.6)	4.3	(2.7)
R2	4.9	(3.0)	5.0	(3.1)	5.1	(3.2)	5.2	(3.2)
R3	5.9	(3.6)	6.0	(3.7)	6.1	(3.8)	6.2	(3.9)
R4	7.1	(4.4)	7.2	(4.5)	7.4	(4.6)	7.5	(4.7)
R5	8.5	(5.3)	8.6	(5.4)	8.8	(5.5)	9.0	(5.6)
R6	10.2	(6.3)	10.4	(6.5)	10.6	(6.6)	10.8	(6.7)

NOTE: *Ratio F18 is only available on 40 Km/h transmissions.*

GROUND SPEEDS in Km/h and (MPH) at Rated Engine Speed using optional Creeper Gears

TM150 only (Rated Engine Speed 2200 rev/min)

Gear Ratio	Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38, 20.8R-38 580/70R-38, 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios								
F1	0.31	(0.19)	0.32	(0.20)	0.32	(0.20)	0.33	(0.20)
F2	0.37	(0.23)	0.38	(0.24)	0.39	(0.24)	0.40	(0.25)
F3	0.45	(0.28)	0.46	(0.28)	0.47	(0.29)	0.47	(0.30)
F4	0.54	(0.33)	0.55	(0.34)	0.56	(0.35)	0.57	(0.36)
F5	0.65	(0.40)	0.66	(0.41)	0.67	(0.42)	0.69	(0.43)
F6	0.78	(0.48)	0.79	(0.49)	0.81	(0.50)	0.83	(0.51)
F7	0.90	(0.56)	0.92	(0.57)	0.94	(0.58)	0.95	(0.59)
F8	1.08	(0.67)	1.10	(0.69)	1.13	(0.70)	1.15	(0.71)
F9	1.30	(0.81)	1.32	(0.82)	1.35	(0.84)	1.38	(0.86)
F10	1.56	(0.97)	1.59	(0.99)	1.63	(1.01)	1.66	(1.03)
Reverse Ratios								
R1	0.69	(0.43)	0.70	(0.44)	0.72	(0.44)	0.73	(0.45)
R2	0.82	(0.51)	0.84	(0.52)	0.86	(0.53)	0.88	(0.54)
R3	0.99	(0.62)	1.01	(0.63)	1.03	(0.64)	1.05	(0.65)
R4	1.19	(0.74)	1.21	(0.76)	1.24	(0.77)	1.26	(0.79)
R5	1.43	(0.89)	1.46	(0.91)	1.49	(0.93)	1.52	(0.95)
R6	1.72	(1.07)	1.76	(1.09)	1.80	(1.12)	1.83	(1.14)

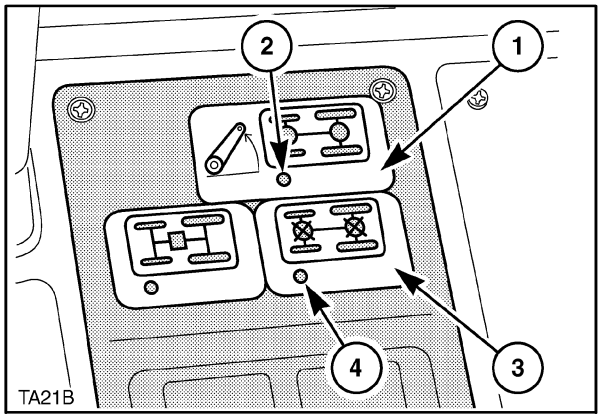
TM165 only (Rated Engine Speed 2300 rev/min)

Gear Ratio	Rear Tyre Size 18.4-38, 18.4R-38 520/70R-38, 600/65R-38		Rear Tyre Size 14.9R-46		Rear Tyre Size 20.8-38, 20.8R-38 580/70R-38, 650/65R-38		Rear Tyre Size 18.4R-42	
Forward Ratios								
F1	0.28	(0.17)	0.30	(0.18)	0.29	(0.18)	0.30	(0.18)
F2	0.34	(0.21)	0.36	(0.21)	0.35	(0.22)	0.36	(0.22)
F3	0.40	(0.25)	0.43	(0.26)	0.42	(0.26)	0.43	(0.27)
F4	0.48	(0.30)	0.52	(0.31)	0.50	(0.31)	0.51	(0.32)
F5	0.58	(0.36)	0.62	(0.37)	0.61	(0.38)	0.62	(0.38)
F6	0.70	(0.44)	0.74	(0.44)	0.73	(0.45)	0.74	(0.46)
F7	0.89	(0.55)	0.94	(0.56)	0.93	(0.58)	0.94	(0.59)
F8	1.07	(0.66)	1.13	(0.68)	1.11	(0.69)	1.13	(0.70)
F9	1.28	(0.80)	1.36	(0.81)	1.34	(0.83)	1.36	(0.84)
F10	1.54	(0.96)	1.64	(0.98)	1.61	(1.00)	1.63	(1.02)
Reverse Ratios								
R1	0.68	(0.42)	0.72	(0.43)	0.71	(0.44)	0.72	(0.45)
R2	0.81	(0.51)	0.86	(0.52)	0.85	(0.53)	0.86	(0.54)
R3	0.98	(0.61)	1.04	(0.62)	1.02	(0.63)	1.04	(0.64)
R4	1.18	(0.73)	1.25	(0.74)	1.23	(0.76)	1.25	(0.78)
R5	1.41	(0.88)	1.50	(0.90)	1.47	(0.92)	1.50	(0.93)
R6	1.70	(1.06)	1.81	(1.08)	1.77	(1.10)	1.80	(1.12)

ELECTRONIC MANAGEMENT UNIT

The electronic management unit, located on the right-hand console, controls the differential lock, four wheel drive functions and the tractor work lamps.

Dependent upon tractor specification, units with 3 or 4 touch pads may be installed. The basic unit with 3 touch pads is shown in Figure 174. Figure 175 illustrates the unit with 4 touch pads. The work lamp switch panel is located immediately below and is shown in Figures 186 and 187.

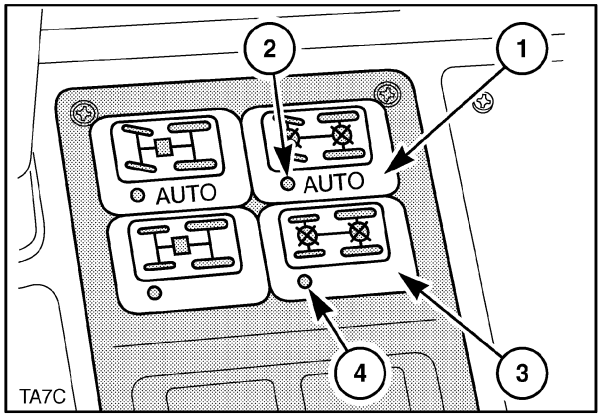


174

FRONT AND REAR DIFFERENTIAL LOCK - Figure 174 or 175

Four wheel drive tractors have a differential lock installed in the front and rear axles to lock all four wheels together in conditions where wheel slip may be encountered. Two wheel drive tractors have a differential lock in the rear axle only.

The differential locks are activated by two touch pads on the electronic management unit. Touch a pad (1) or (3) and a 'beep' will be heard from the alarm and the LED (2) or (4) in the corner of the touch pad will illuminate to verify that the differential lock mode has been selected.



175

Dependent upon tractor specification, differing modes may be selected, as follows:

a) Manual mode (all models)

b) Semi-automatic mode (3-pad unit only)

c) Fully automatic mode (4-pad unit only)

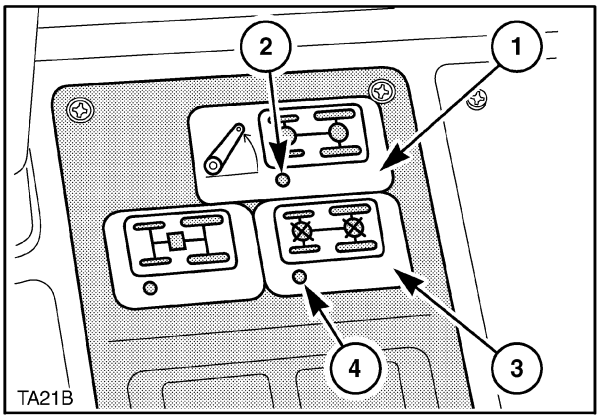
⚠ WARNING ⚠

Avoid using the differential lock at speeds above 8km/h (5 MPH) or when turning the tractor. When engaged, the differential lock will make steering the tractor very difficult.

IMPORTANT: *If wheelspin is encountered, avoid shock loads to the transmission by reducing engine speed before engaging the differential lock.*

a) Manual Mode (3- or 4-pad unit)
– Figures 176, 177 and 178

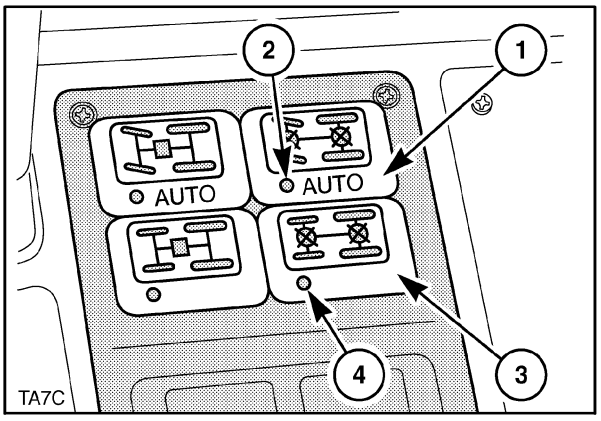
Touch the pad (3) Figure 176 or 177. The alarm will give a 'beep' and the LED (4) in the corner of the pad will illuminate to indicate that the manual differential lock mode is selected. The indicator light (1) Figure 178 on the instrument panel will also illuminate whilst differential lock is engaged.



176

In the manual mode, disengagement occurs as follows:

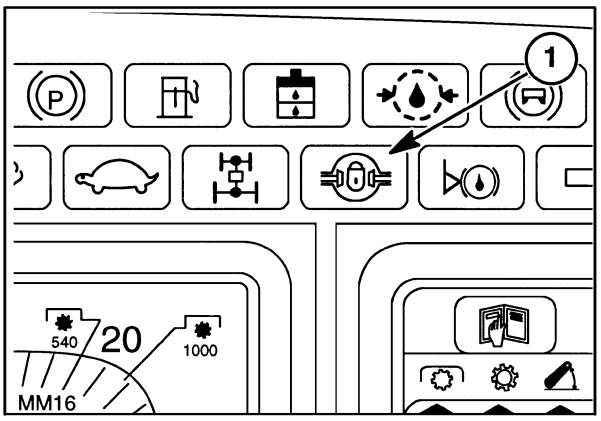
One or both brake pedals applied:–
Differential lock will disengage and LED (4) will extinguish.



177

Touch the pad:–
Differential lock will disengage and LED (4) will extinguish.

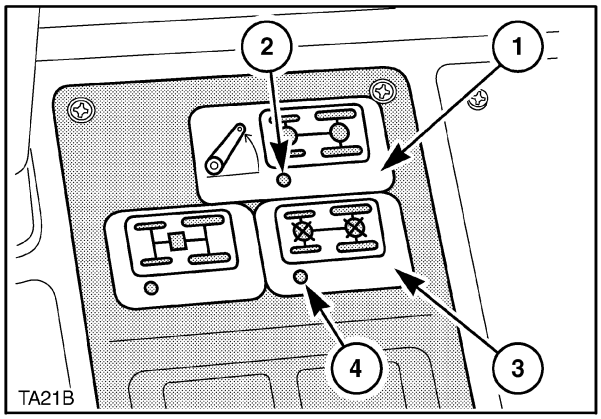
Tractor speed reaches 15 km/h (9 MPH):–
Differential lock will disengage and LED (4) will extinguish.



178

b) Semi-automatic Mode (3-pad unit only) - Figure 179 and 180

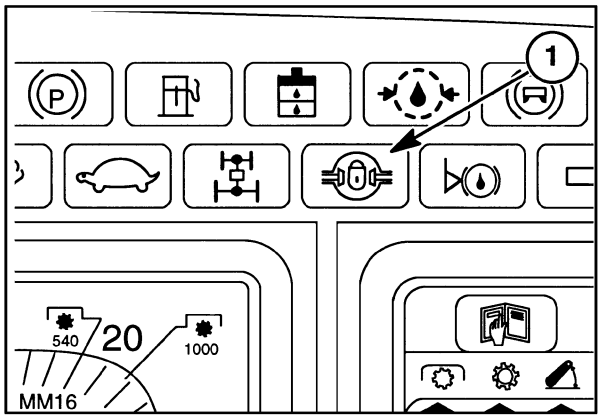
Touch the pad (1) Figure 179. The alarm will give a 'beep' and the LED (2) in the corner of the pad will illuminate to indicate that the semi-automatic differential lock mode is selected. The indicator light (1) Figure 180 on the instrument panel will also illuminate but only remain lit while the differential locks are actually engaged. In the semi-automatic mode, disengagement occurs as follows:



179

Fast raise switch activated:-
Temporary disengagement (will re-engage when the 3 point linkage is lowered).

NOTE: *If the semi-automatic mode is selected with the fast raise switch already in the raised position, the differential locks will engage but disengage when the fast raise switch is subsequently used to raise the 3-point linkage.*



180

One or both brake pedals applied:-
Temporary disengagement.

Touch the pad:-
Differential lock will disengage and LED (2) will extinguish.

Tractor speed reaches 15 km/h (9 MPH):-
Differential lock will disengage and LED (2) will extinguish.

NOTE: *If the key-start switch is turned off while the differential lock mode is engaged, when the switch is turned on again, the semi-automatic mode will re-engage automatically.*

c) Fully Automatic Mode (4-pad unit only) – Figure 181 and 182

To engage both differential locks in the automatic mode, touch the pad (1) Figure 181. The alarm will give a 'beep' and the LED (2) in the corner of the pad will illuminate to indicate that the automatic differential lock mode is selected. The indicator light (1) Figure 182 on the instrument panel will also illuminate but only remain lit while the differential locks are actually engaged.

In the fully automatic mode, disengagement occurs as follows:

One or both brake pedals applied:-
Temporary disengagement.

Touch the pad:-
Differential lock will disengage and LED (2) will extinguish.

Tractor steering angle greater than 20° and tractor speed less than 10 km/h (6 MPH):-
Temporary disengagement.

Tractor steering angle greater than 10° and tractor speed within the range of 10-15 km/h (6-9 MPH):-
Temporary disengagement.

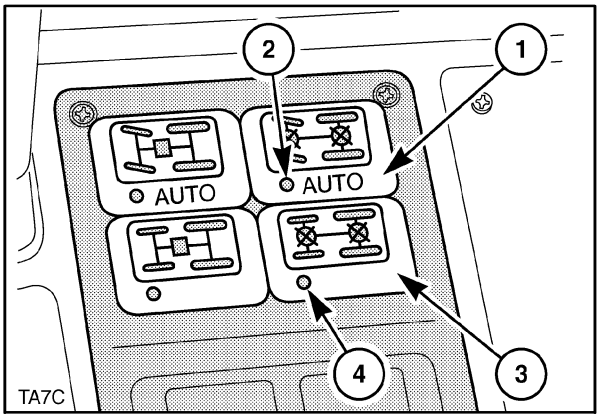
NOTE: *Alternative tractor steering angles may be programmed into the automatic mode. Consult your authorised dealer.*

Fast raise switch activated:-
Temporary disengagement (will re engage when 3 point linkage is lowered.

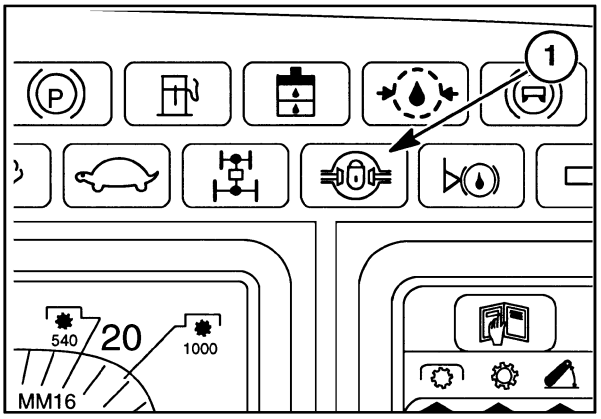
NOTE: *If the automatic mode is selected with the fast raise switch already in the raised position, the differential locks will engage but disengage when the fast raise switch is subsequently used to raise the 3-point linkage.*

Tractor speed reaches 15 km/h (9 MPH):-
Differential lock will disengage and LED (2) will extinguish.

NOTE: *If the key-start switch is turned off while the differential lock mode is engaged, when the switch is turned on again, the automatic mode will re-engage automatically.*



181

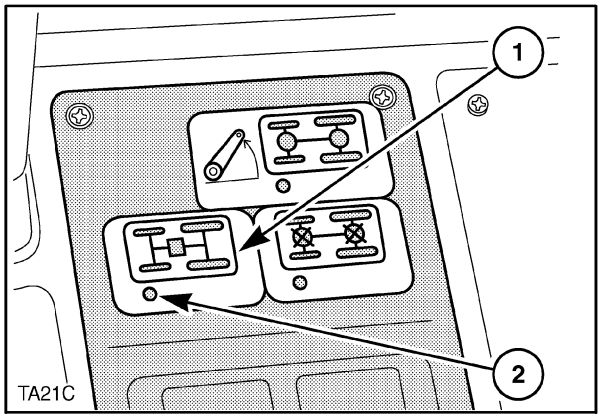


182

FOUR WHEEL DRIVE (where fitted) - Figures 183 to 185

Four wheel drive can be engaged and disengaged in all gears (forward and reverse) during operation and under full load.

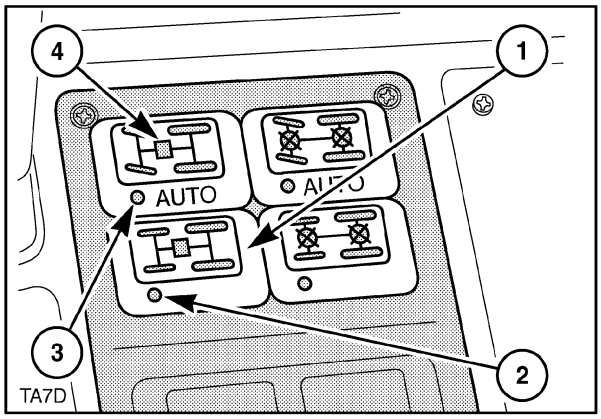
If your tractor is equipped with four wheel drive, one or two touch pads are provided, dependent upon tractor specification level (see Figures 183 and 184). The pad(s) is/are on the electronic management unit located on the right-hand console and provide a choice of.



183

a) Manual mode (all models)

b) Automatic mode (optional).



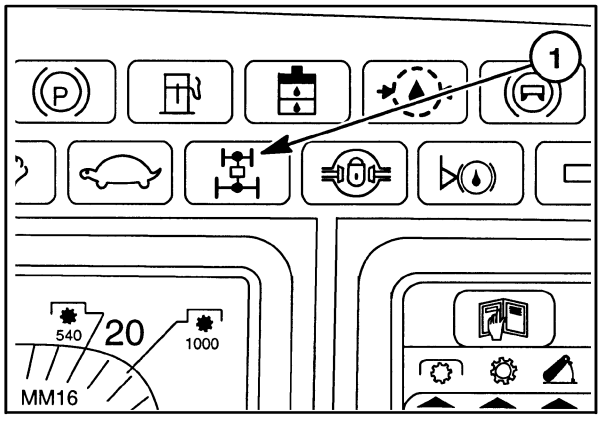
184

a) Manual Mode - Figure 183 or 184

To engage four wheel drive in the manual mode, touch the pad (1) Figure 183 or 184. The LED (2) in the corner of the pad will illuminate to indicate that four wheel drive is engaged. The indicator light (1) Figure 185 on the instrument panel will also illuminate.

Touch the pad a second time to disengage four wheel drive.

NOTE: *If the key-start switch is turned off while four wheel drive mode is engaged, when the switch is turned on again, four wheel drive will re-engage automatically.*



185

b) Automatic Mode (where fitted) - Figure 184 or 185

To engage four wheel drive in the automatic mode, touch the pad (4) Figure 184. The LED (3) in the corner of the pad will illuminate to indicate that the four wheel drive automatic mode is selected.

The indicator light (1) Figure 185, on the instrument panel will extinguish and light up again during automatic disengagement and engagement of the drive to the front wheels.

In the automatic mode four wheel drive will remain engaged but will disengage under the following circumstances:

Tractor steering angle greater than 30° and speed less than 10 km/h (6 MPH):-
Temporary disengagement.

Tractor steering angle greater than 25° and tractor speed within the range of 10-20 km/h (6-12 MPH):-
Temporary disengagement.

Tractor speed exceeds 20 km/h (12 MPH):-
Temporary disengagement.

NOTE: *Alternative tractor steering angles may be programmed into the automatic mode. Consult your authorised dealer.*

Touch the pad a second time to disengage four wheel drive.

NOTE: *If the key-start switch is turned off while four wheel drive mode is engaged, when the switch is turned on again, four wheel drive will re-engage automatically.*

4WD Operating Precautions

WARNING

Four wheel drive greatly increases traction. Extra caution is needed on slopes. Compared to two-wheel drive, a 4WD tractor maintains traction on steeper slopes, increasing the possibility of overturning.

IMPORTANT: *To avoid excessive tyre wear when travelling on the public highway or any hard surface, it is recommended that four wheel drive be disengaged. Always use the specified front/rear tyre combinations to ensure acceptable tyre wear.*

WARNING

Tractors with four wheel drive engaged or disengaged should not be allowed to exceed 40 km/h (25 MPH). Overspeeding by towing or coasting downhill with clutch depressed or transmission in neutral may cause loss of control, personal injury to the operator or bystanders or mechanical failure.

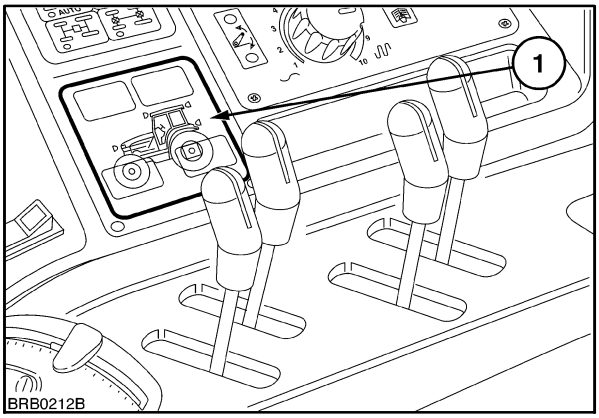
CAUTION

On four wheel drive tractors, drive to the front axle is automatically engaged when both brake pedals are applied simutaneously to provide four wheel braking. Additionally, you may have the optional front disc brakes. The effectiveness of four wheel braking greatly enhances tractor braking performance therefore appropriate care should be exercised during heavy braking.

Front tyres should never be inflated above the recommended pressure. Ideally, rear tyre pressures should be maintained at least 0.4 bar (6 lbf/in^2) above front tyre pressures, provided the manufacturers' recommendations are not exceeded.

IMPORTANT: ***Never*** *attempt to drive the tractor with the drive shaft removed, even if you have no intention of using four wheel drive. With the drive shaft removed, application of the brakes will result in severe damage to transmission components.*

FRONT AND REAR WORKLAMPS

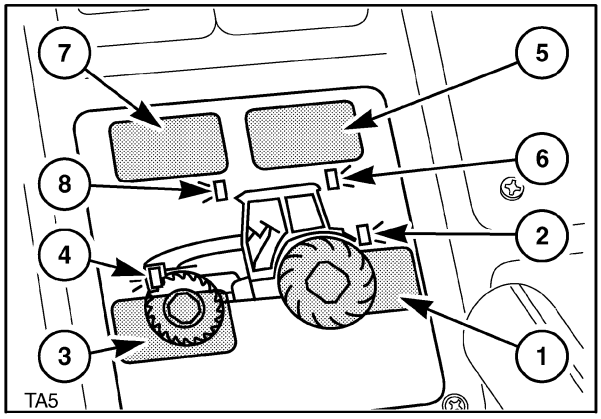


186

Switch Panel - Figure 186

The worklamp switch panel (1) on the right-hand console, forms part of the Electronic Management Unit. The lower section of the unit contains two or four touch pads, used to activate the worklamps.

Up to five pairs of worklamps may be installed on the tractor, dependent upon tractor specification level.



187

Touch Pads - Figure 187

Touch the pad (1) to operate the rear, fender-mounted worklamps. The corresponding LED (2) will illuminate.

Touch the pad (3) to operate the front, grille-mounted worklamps (and the additional pair mounted on the front grab rails, if fitted). The LED (4) will illuminate with the work lamps.

Touch the pad (5) to operate the rear, roof-mounted worklamps. The LED (6) will illuminate with the worklamps.

Touch the pad (7) to operate the front, roof-mounted worklamps. The LED (8) will illuminate with the worklamps.

NOTE: *The worklamps are only operative with the tractor lights switched on. During operation, if the tractor lights are turned off, the worklamps will be extinguished. However, the setting will be memorised and the same worklamps will be activated when the lights are turned on again. If the key-start switch and tractor lights are turned off, the worklamps will also be extinguished. When the tractor lights are turned on again the worklamps will remain off, until reselected by means of the touch pads.*

SECTION 3
FIELD OPERATION

BEFORE OPERATING

CAUTION

Before driving or operating the tractor, study the safety precautions in Section 1 of this Manual.

Read this section carefully for a thorough understanding of operational requirements. Even if you operate other tractors, you should thoroughly read this section of the manual and ensure that you are familiar with the location and function of all the features of the tractor.

Do not start the engine or attempt to drive or operate the tractor until you are fully accustomed with all the controls. It is too late to learn once the tractor is moving. If in doubt about any aspect of operation of the tractor, consult your authorised dealer.

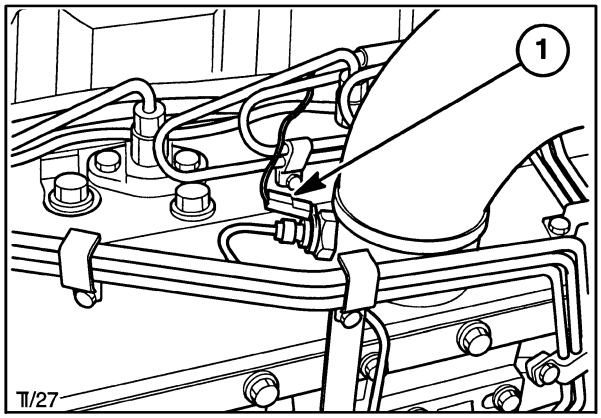
See Section 4 for lubrication and maintenance requirements. Tractor specifications will be found in Section 8.

This section is split into 10 subjects, as follows. A comprehensive index is provided at the end of this manual.

Subject	Page
Starting and Stopping the Engine	3-2
Rear Power Take-Off	3-9
Front Power Take-Off and Hydraulic Lift	3-25
Mechanical Lower Link Sensing Hydraulics	3-32
Remote Control Valves (open centre)	3-38
Electronic Draft Control	3-45
Remote Control Valves (CCLS)	3-58
Three-point Linkage	3-65
Front Wheel Track Adjustment	3-73
Rear Wheel Track Adjustment	3-83
Ballasting and Tyres	3-97

STARTING THE ENGINE

Figure 1



1

⚠ WARNING ⚠

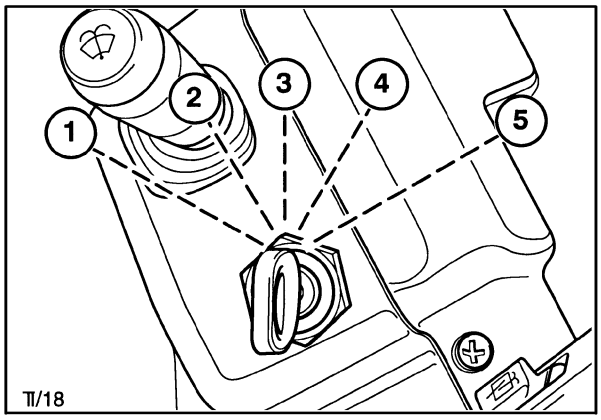
Your tractor is equipped with the Thermostart cold weather starting aid. Do ***not*** *use ether with Thermostart installed. It will explode in the intake manifold. If, in an emergency, it is necessary to use ether, disconnect the Thermostart wire (1) from the heater terminal on the intake manifold.*

The Thermostart, which is effective in ambient temperatures down to -18° C (0° F), consists of a heating element installed in the intake manifold. When operated by the key-start switch, the Thermo-start will ignite fuel in the manifold, heating indrawn air prior to it being drawn into the combustion chamber.

If temperatures below -18° C (0° F) are encountered, a coolant immersion heater is available as an accessory. The coolant immersion heater is effective in ambient temperatures down to -29° C (-20° F) when used in conjunction with the Thermostart.

Figure 2

A five-position key-start switch is installed. The key-start switch positions are as follows:



2

Position 1	Thermostart activated
Position 2	Off
Position 3	Accessories on
Position 4	Warning lights and instruments on
Position 5	Starter motor engaged

IMPORTANT: *Never push or tow the tractor to start the engine. Doing so may overstress the drive train.*

NOTE: *Neutral start switches prevent operation of the starting motor unless the forward/reverse (shuttle) lever is in the neutral (N) position (except Synchro Command) and the clutch pedal depressed (all transmissions).*

Before starting the engine, always carry out the following procedure:

- Sit in the driver's seat.
- Ensure that the parking brake is firmly applied.
- Ensure that **all** gearshift levers are in neutral. (Synchro Command and Dual command)
- Ensure the P.T.O. is disengaged.
- Place the remote control valve levers in the neutral position.
- Move the hydraulic lift control lever fully forward. (Synchro Command only)

⚠ CAUTION ⚠

Check the area beneath the equipment to ensure that no injury or damage will be caused when equipment is lowered.

- Depress the clutch pedal.

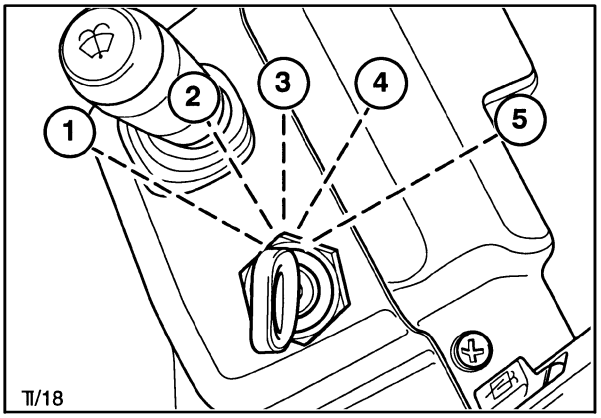
IMPORTANT: *Turbo-charged engines only: The high operating speed of the turbo-charger makes it essential that adequate lubrication is assured when the engine is started. Therefore, idle the engine at 1000 rev/min for approximately one minute before driving the tractor.*

Starting in warm weather or when the engine is hot – Figure 3

- Open the hand throttle halfway, depress the clutch and turn the key-start switch fully clockwise to position (5) to operate the starting motor. Crank the engine until it starts but do not operate the starting motor for more than 60 seconds.

NOTE: *Once the starter motor has been operated, it is necessary to return the key-start switch back to the 'off' position before the starting motor can be re-activated.*

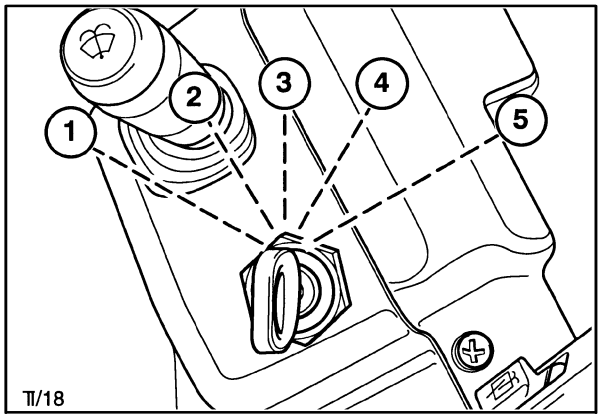
- Return the throttle to the idle position and check that all warning lights extinguish and gauge readings are normal.



3

Starting in cold weather - below 4° C (40° F) with a cold engine - Figure 4

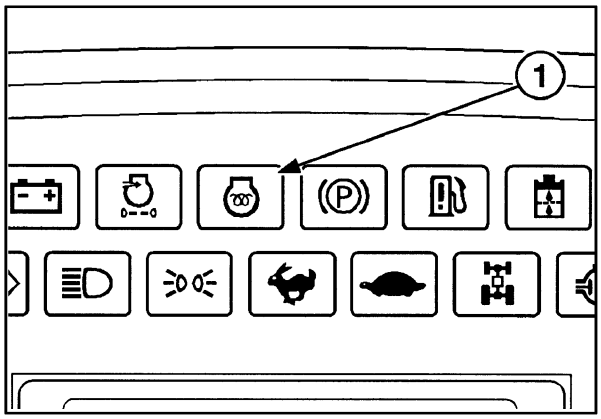
- Open the hand throttle halfway and turn the key-start switch anti-clockwise to position (1).



4

Figure 5

- An indicator light (1) on the instrument panel will illuminate to show that the Thermostart heater is active.



5

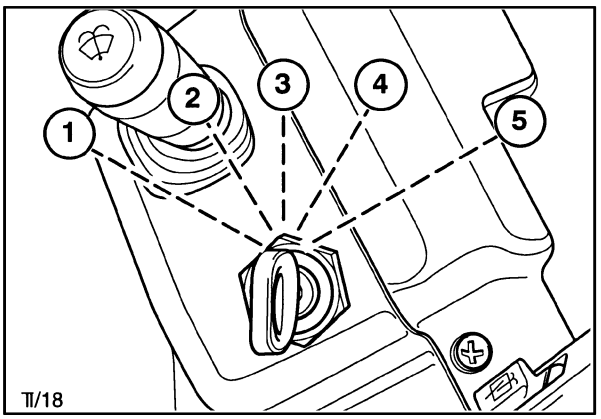
Figure 6

- Allow the key to spring-return to position (2). When the light goes out, depress the clutch and turn the key fully clockwise to position (5). Crank the engine until it starts but do not operate the starting motor for more than 60 seconds.

NOTE: *Provided that the key is turned to the crank position (5) within 3 seconds of the indicator light going out, the Thermostart will be re-activated during cranking.*

- If the engine fails to start, repeat the foregoing procedure. If the engine still fails to start, allow the battery to recover for 4 - 5 minutes then repeat the procedure.

- When the engine starts, return the throttle to the idle position and check that all warning lights extinguish and gauge readings are normal.



6

COOLANT IMMERSION HEATER (where fitted) - Figure 7

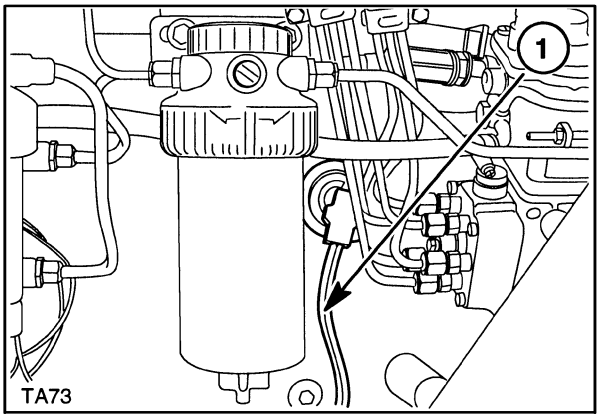
This dealer installed accessory consists of a heating element fitted into one of the core plug apertures on the right-hand side of the block. The heater is available in 115 volts A.C only. This accessory provides easier starting down to -29° C (-20° F).

⚠ WARNING ⚠

To avoid shocks or other injuries, never use an unearthed or inadequate extension lead. Always use an earthed, three core extension lead, which is rated for at least a 15 amp load, in conjunction with a residual current circuit breaker or earth leakage trip device.

To operate the heater, connect the plug on the free end of the heater cable (1) to a suitable 115 volt outlet (or 230 volt using a transformer), for up to four hours before carrying out the cold weather starting procedure.

NOTE: *The heater may be left plugged in for more than four hours without harm. However, no noticeable increase in the heater's effectiveness will be achieved after this period.*



7

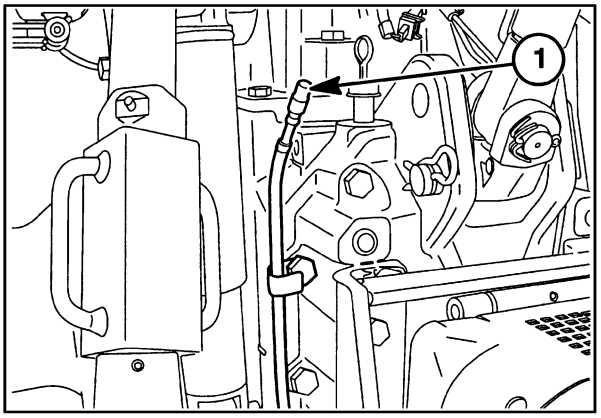
TRANSMISSION OIL HEATER (where fitted) - Figure 8

This dealer installed accessory consists of a 115 volts A.C. heating element installed in the transmission housing. A cable connected to the heater is clipped to the left of P.T.O. shaft housing. This accessory provides for faster warm up of the transmission/hydraulic oil when operating in cold climates.

⚠ WARNING ⚠

To avoid shocks or other injuries, never use an unearthed or inadequate extension lead. Always use an earthed, three core extension lead, which is rated for at least a 15 amp load, in conjunction with a residual current circuit breaker or earth leakage trip device.

To operate the heater, connect the plug on the free end of the heater cable (1) to a suitable 115 volt outlet (using a voltage transformer, if necessary) for up to four hours before starting the engine.



8

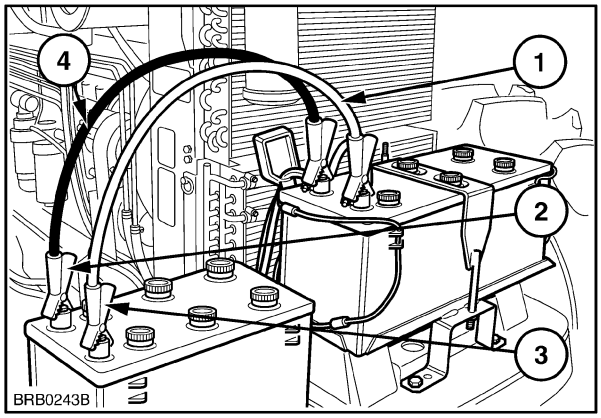
NOTE: *The heater may be left plugged in for more than four hours without harm. However, no noticeable*

increase in the heater's effectiveness will be achieved after this period.

STARTING THE TRACTOR WITH JUMP LEADS

⚠ WARNING ⚠

Operate the starter motor only from the driver's seat. If the key-start switch is by-passed, the engine may start inadvertently in gear and cause sudden and unexpected movement of the tractor which may cause serious injury. Wear eye protection when connecting jump leads or when charging the battery.



9

Figure 9

If it is necessary to use jump leads (booster cables) to start the tractor, use only heavy duty leads. Proceed as follows:

NOTE: *If your tractor has dual batteries, make connections only to the lower battery of the two.*

- Connect one end of the red jump lead (4) to the tractor battery positive (+) terminal, as shown and the other end to the positive (+) terminal of the auxiliary battery (3).

- Connect one end of the black jump lead (1) to the tractor battery negative (-) terminal and the other end to the negative (-) terminal of the auxiliary battery (2). Follow the starting procedure previously described.

- When the engine starts allow it to run at idle speed, turn on all electrical equipment (lights, etc.) then disconnect the jump leads in the reverse order to the connecting procedure. This will help protect the alternator from possible damage due to extreme load changes.

IMPORTANT: *When using an auxiliary battery to start the engine, ensure that the polarity of the jump leads is correct - **positive to positive, negative to negative**, otherwise the alternator may be damaged. Only use an auxiliary battery if the tractor batteries are discharged. Excessive amperage (above 1600 cca) may damage the starting motor. In the event of the batteries being severely discharged, such that terminal voltage is below 7 volts, recovery will require a special charging procedure. See your authorised dealer.*

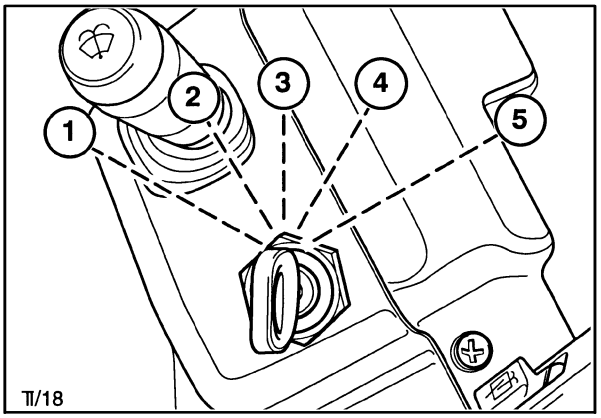
NOTE: *Tractors with Dual Command, Range Command or Power Command transmission: If the tractor is jump-started with the transmission in gear, the transmission will be disabled. To reactivate the transmission, move all the gear levers to neutral, then depress and release the clutch pedal. If the shuttle lever is already in neutral, move it to the forward or reverse position, then to neutral and depress and release the clutch pedal.*

STOPPING THE ENGINE - Figure 10

IMPORTANT: *Turbo-charged engines only - Before stopping, idle the engine at 1000 rev/min for approximately one minute. This will allow the turbo-charger and manifold to cool and prevent possible distortion of components.*

To stop the engine, carry out the following procedure:

- Sit in the driver's seat.
- Close the throttle.
- Ensure that the parking brake is firmly applied.
- Ensure that **all** gearshift levers are in neutral.
- Ensure the P.T.O. is disengaged.
- Place the remote control valve levers in the neutral position.
- Move the hydraulic lift control lever fully forward to lower all hydraulic equipment to the ground.
- Turn the key-start switch off - position (3).



10

RUNNING-IN PROCEDURE

Your new tractor will provide long and dependable service if given proper care during the 50 hour running-in period and if serviced at the recommended intervals.

Avoid overloading the engine. Operating in too high a gear under heavy load may cause excessive engine overloading. Overloading occurs when the engine will not respond to a throttle increase.

Do not operate without a load on the engine. This can be as harmful to the engine as overloading. Vary the type of operation undertaken so that the engine is subjected to heavy as well as light loads during the running-in period.

Use the lower gear ratios when pulling heavy loads and avoid continuous operation at constant engine speeds. Operating the tractor in too low a gear with a light load and high engine speed will waste fuel. You will save fuel and minimise engine wear by selecting the correct gear ratio for each particular operation.

Check the instruments and warning lights frequently and keep the radiator and various oil reservoirs filled to the recommended levels.

PRE-OPERATION CHECKS

Before operating the tractor, ensure that you are thoroughly familiar with the location and operation of the controls.

Perform all daily lubrication and maintenance operations in accordance with Section 4.

After completing the daily maintenance operations, perform a walk around visual inspection of the tractor. Pay particular attention to the following items:

- Fan belt for cracks
- Engine area for accumulation of debris
- Hoses, lines and fittings for leaks or damage.
- Tyres for damage
- Hardware for looseness
- Driveline and hydraulic pump areas for leaks or debris accumulation

Make any necessary repairs before using the tractor.

CARRYING THE TRACTOR ON A TRANSPORTER

Transport the tractor with all four wheels on a flat bed trailer or truck. Securely chain the tractor to the transporter.

IMPORTANT: *Do not chain around the four wheel drive shaft, steering cylinders, front wheel drive axle or other components that could be damaged by contacting the chain or by heavy loading.*

Use the drawbar or drawbar hanger for a rear tie down point.

IMPORTANT: *Cover the silencer outlet so that the wind does not spin the turbocharger and damage the bearings.*

Turbocharger turbine freewheeling (turning without engine running) must be avoided since lubrication will not be provided to the turbocharger bearings.

TOWING THE TRACTOR

IMPORTANT: *The tractor should only be towed a short distance, such as out of a building. Do not tow on roadways or as a method of transport.*

IMPORTANT: *If it is necessary to tow the tractor, all **gear levers must** be moved to the **neutral position before** stopping the engine otherwise damage to transmission components may occur during towing. If creeper gears (reduction gear set) are fitted, then the selector lever must be in the **off** position.*

Use a strong chain when towing the tractor. Tow the tractor from the rear using only the drawbar, rear tow hitch or the three-point hitch. Tow the tractor from the front using the tow pin in the front weights or front support. Have an operator steer and brake the tractor.

To avoid damaging the transmission or other components that turn but are not lubricated during towing, observe the following:

- Only tow a short distance
- Keep speed below 5 MPH (8 km/h)
- If possible, run the engine to provide lubrication and power steering.

⚠ CAUTION ⚠

Do not tow the tractor faster than 5 MPH (8 km/h). The steering is much slower and steering wheel effort is much greater without the engine running.

⚠ WARNING ⚠

Do not use cables or rope to tow the tractor. If the cable or rope breaks or slips, it may whip with sufficient force to cause serious injury. When using a chain, attach the chain with the hook open side facing up. If the hook slips, it will drop down instead of flying up.

NOTE: *Four wheel drive will be engaged if the engine is not running, regardless of the position of the 4WD activation switch.*

REAR POWER TAKE-OFF

Description

The power take-off (P.T.O.) transfers engine power directly to mounted, semi-mounted or trailed equipment via a splined shaft at the rear of the tractor.

Four types of rear P.T.O. system are available, dependent upon tractor model and country.

a) Two-speed P.T.O. (North America only) with inter-changeable output shafts.

b) Two-speed or three-speed, shiftable P.T.O. (except North America) with inter-changeable output shafts and the option of fender-mounted switches for stationary P.T.O. work.

c) Three-speed ground drive P.T.O., available in conjunction with three speed shiftable P.T.O. above. (except North America).

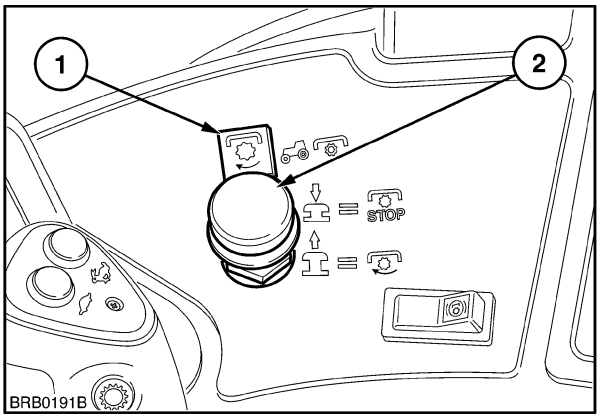


Figure 11

The P.T.O. is engaged and disengaged by means of a knob (2) on the right-hand console. The adjacent warning light (1) will illuminate when the P.T.O. is engaged.

11

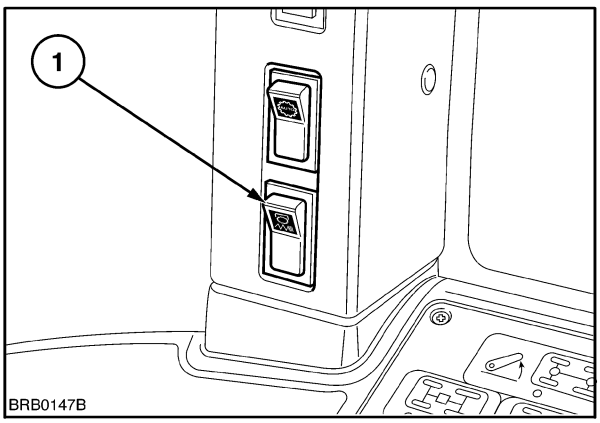


Figure 12

A 'soft start' facility is provided on all models to permit easy start up of heavy, high inertia, P.T.O.-driven equipment. Soft start is engaged by means of a rocker switch (1), on the right-hand B-pillar.

Soft start 'feathers' the P.T.O. clutch over the first 5 seconds of engagement to provide a slower, gradual take up of the drive.

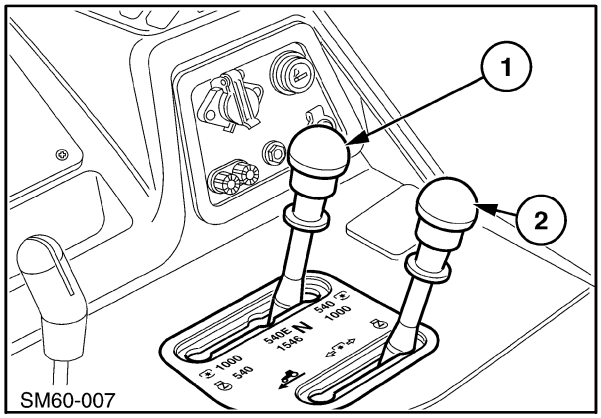
NOTE: *Soft start only operates at engine speeds of 1800 rev/min and below. Above this speed, normal P.T.O. engagement will occur, even if the switch is actuated.*

12

Figure 13
With shiftable P.T.O., a range lever is provided. The lever is used to select one of two or three P.T.O. speed ranges to provide power or economy. The range lever (1), is located at the rear of the right-hand console.

Ground drive P.T.O. is available, in conjunction with 3-speed, shiftable P.T.O., on all models except the TM165. As suggested by the name, ground drive P.T.O. speed is directly related to rotation of the rear wheels rather than engine speed. When ground drive P.T.O. is installed, a second lever (2) is provided.

Three ground speed ranges are provided, selected by means of the P.T.O. range lever (1). The lever (2) is used to select ground drive.



13

ATTACHING P.T.O. DRIVEN EQUIPMENT

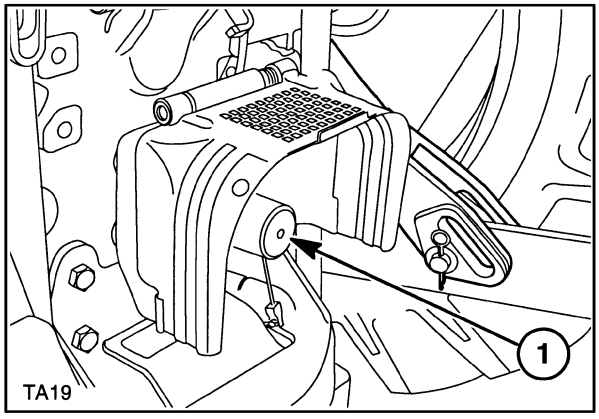
CAUTION

Before attaching or detaching equipment or changing the P.T.O. shaft:

- *Firmly apply the parking brake.*
- *Ensure that **all** gearshift levers are in neutral.*
- *Stop the engine, disengage the P.T.O. (knob fully down) and wait until the P.T.O. and equipment stops before getting off the tractor.*

Mount or hitch the equipment to the tractor as outlined in THREE-POINT LINKAGE on page 3-65.

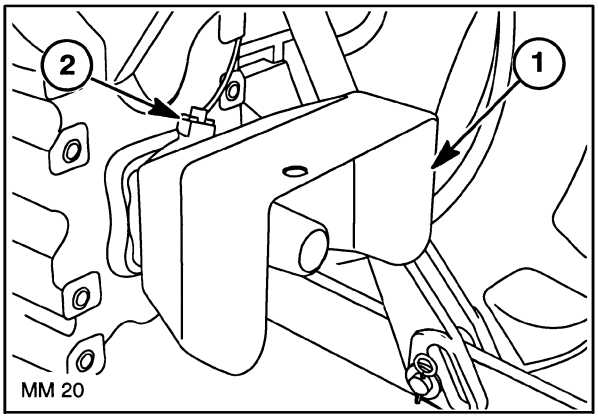
Figure 14
Two types of P.T.O. guard are available. Both types of guard serve as a support for drive-line shields used with P.T.O.-driven equipment and provide for your safety. Do not modify the guard. A plastic P.T.O. cap (2) is also supplied and should always be installed over the shaft when the P.T.O. is not in use.



14

Figure 15

A fixed P.T.O. guard (1), is fitted as standard. It may be necessary to remove the guard to aid installation of P.T.O.- driven equipment. If so, extract the four socket-head screws securing the guard to the rear axle housing and lift off. Take special care not to disturb or damage the speed sensor (2), where fitted. Replace the guard after connecting equipment.

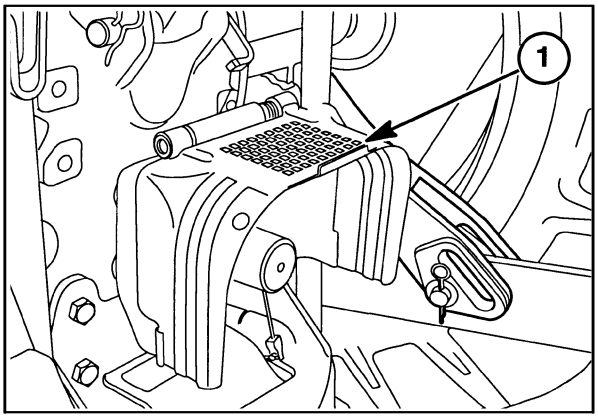


15

Figure 16

An alternative, flip-up P.T.O. guard is available as an option. The flip-up guard (1), has a special spring-loaded hinge that will retain the guard in any one of several points between the horizontal and fully raised positions.

To connect P.T.O.-driven equipment to the P.T.O. shaft, tilt the guard up or remove, as necessary for access. Pull the plastic cap from the shaft and store it in the tractor toolbox.

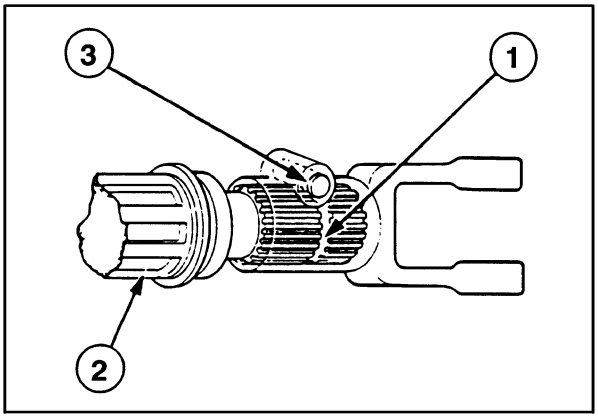


16

Figure 17

Attach the implement to the P.T.O. shaft, ensuring that the implement driveshaft coupler lock pin (3) or detent balls engage the groove in the P.T.O. shaft (2). If the coupler does not have a locking arrangement, pin the coupler to the shaft. Lower the flip-up guard or re-install the fixed guard.

IMPORTANT: *After attaching mounted equipment, carefully raise and lower using Position Control and check clearances and P.T.O. shaft slide range and articulation. When attaching trailed equipment, ensure that the drawbar is correctly set. See* 'Swinging Drawbar' *on page 7-15.*



17

P.T.O. Operating Precautions

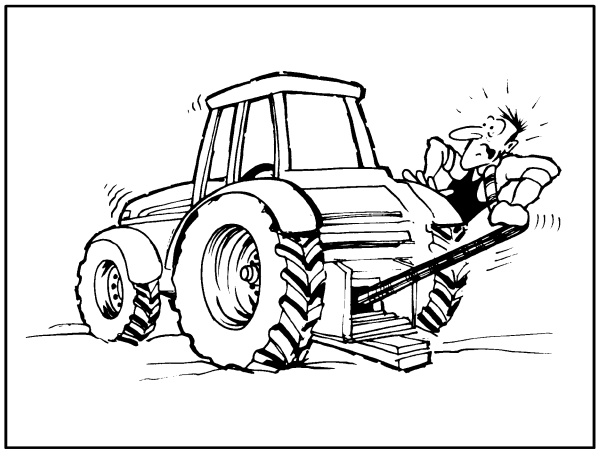
WARNING

Whenever operating P.T.O. equipment, observe the following precautions:

- *Check that you are using the correct P.T.O. speed for the implement. Follow the instructions in the equipment operator's manual.*

- *Ensure that the P.T.O. guard is installed when using P.T.O. driven equipment.*

Figure 18

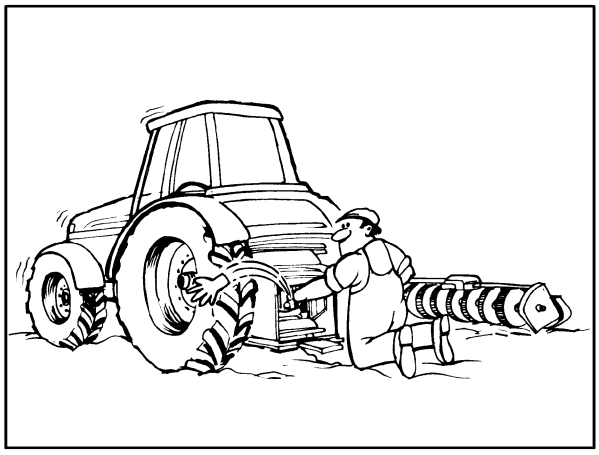


18

- *Do not wear loose clothing when operating P.T.O. driven equipment.*

- *Firmly apply the parking brake, place **all** gearshift levers in neutral and block all four wheels before operating any stationary P.T.O. equipment.*

Figure 19



19

- *Do not approach, clean or adjust P.T.O. driven equipment while the tractor engine is still running. Shut off the tractor engine, disengage the P.T.O. (knob fully down) and wait until the P.T.O. and equipment stops before getting off the tractor or working on the P.T.O. or equipment.*

TWO-SPEED P.T.O. WITH INTER- CHANGEABLE SHAFTS (NORTH AMERICA ONLY)

A 6-spline P.T.O. output shaft of 1.375 in. (34.9 mm) diameter is supplied, designed to operate at 540 rev/min.

A 21-spline shaft of 1.375 in. (34.9 mm) diameter, designed to operate at 1000 rev/min., is also supplied with the tractor.

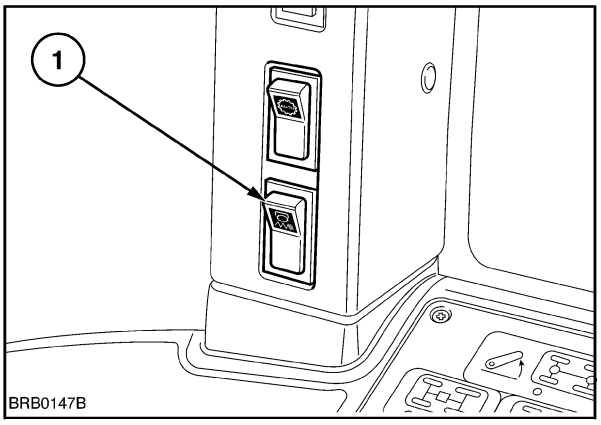
An alternative 20-spline shaft of 1.75 in. (44.45 mm) diameter, designed to operate at 1000 rev/min., is available from your dealer.

P.T.O. driven equipment not having a high power requirement is designed to run at 540 P.T.O. rev/min and will have a 6-spline female coupling. A P.T.O. shaft speed of 540 rev/min is obtained at an engine speed of 1969 rev/min.

Equipment having a high power requirement is designed to operate at 1000 P.T.O. rev/min and will be provided with a 21-spline female coupling. With the 21-spline shaft installed, run the engine at 2120 rev/min to provide a P.T.O. speed of 1000 rev/min.

IMPORTANT: *Implements with a high power requirement should be operated with the 1000 rev/min. P.T.O. (21-spline shaft). If it is necessary to use the 6-spline shaft (at 540 rev/min.) to operate implements having a power requirement of more than 65 horsepower, then it is strongly recommended that the implement is equipped with a slip clutch to avoid damage to the P.T.O. output shaft and other tractor components.*

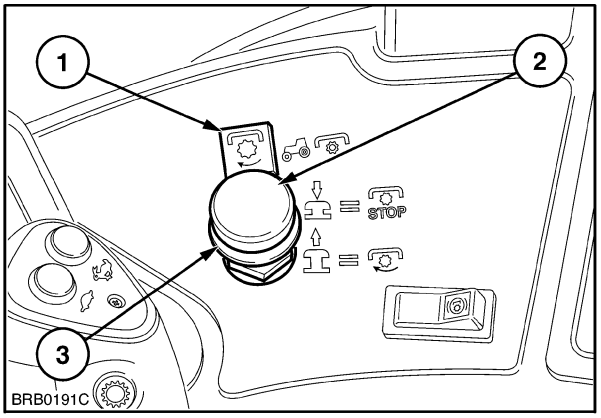
NOTE: *When required, change the P.T.O. shaft to suit the operation and equipment in use, as described under* 'Changing the P.T.O. Output Shaft' *on page 3-24*.



20

Operating - Figure 20

IMPORTANT: *To avoid shock loads to the P.T.O., reduce engine speed to approximately 1000 rev/min when engaging the P.T.O., then increase engine speed by means of the throttle to obtain the required P.T.O. speed. Use the 'soft start' engagement feature for heavy, P.T.O.-driven equipment, to ensure smooth take up of the drive. Press in the top of the switch (1), to engage 'soft start'.*



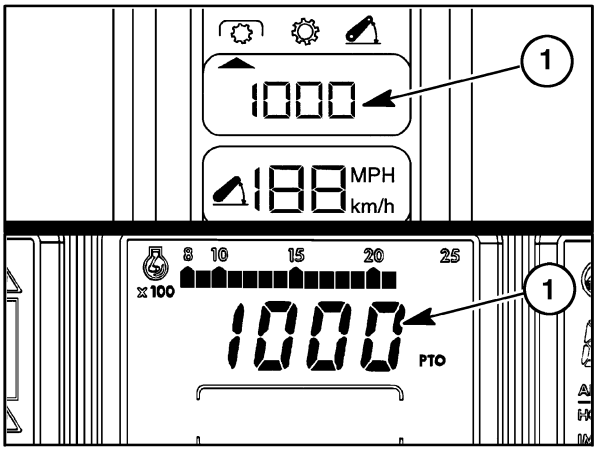
21

Figure 21

With the engine running at 1000 rev/min. or less, press the knob (2) and lift the collar (3) and knob up to engage the P.T.O. The knob will remain up while the P.T.O. is engaged and the adjacent warning light (1) will be illuminated.

Figure 22

Open the throttle to obtain the required engine/P.T.O. speeds. If your tractor has an analogue/digital or electronic instrument console, the P.T.O. shaft speed can be displayed at (1).



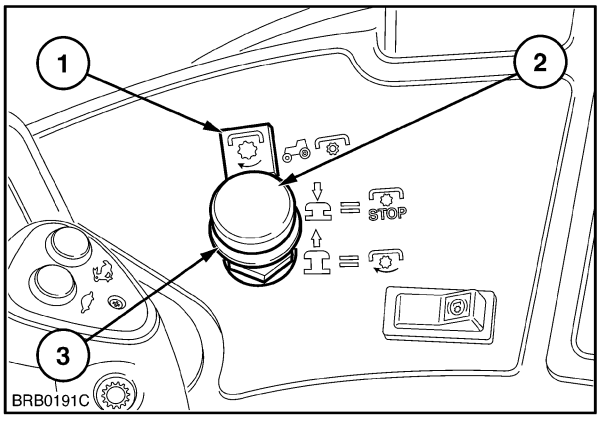
22

Figure 23

NOTE: *The light (1), will be illuminated when the P.T.O. is engaged. If overspeeding of the P.T.O. occurs (P.T.O. speed exceeds 630 rev/min) the light will flash for 5 seconds, then remain steady. When the 1000 rev/min/shaft is in use, the light will also flash (but may be ignored) as P.T.O. shaft speed passes through the 630 rev/min range. The light will flash again at 1170 P.T.O. rev/min to indicate that overspeeding has occurred in the 1000 rev/min P.T.O. range.*

Press the knob firmly down to disengage the P.T.O.

NOTE: *If the engine is stopped, the P.T.O. will not operate when the engine is restarted until the P.T.O. knob is reset. Return the selector knob manually to the 'off' position (by pressing the knob down) then re-engage the P.T.O., as previously described.*



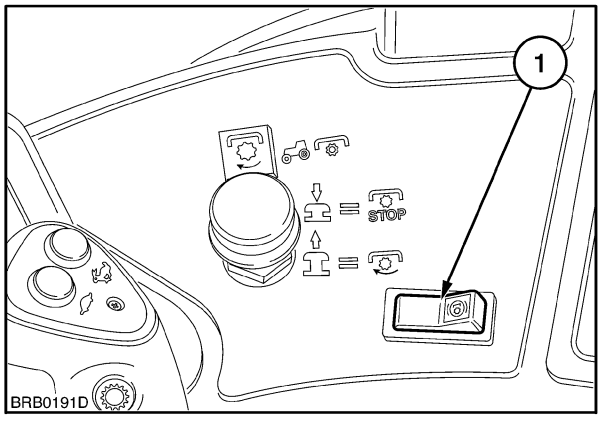
23

Figure 24

IMPORTANT: *An automatic P.T.O. brake is installed to stop shaft rotation quickly when the P.T.O. is disengaged. To avoid overstressing the P.T.O. brake, slow down the implement by reducing engine speed* ***before*** *disengaging the P.T.O. This is particularly important with implements having a high inertia. Such implements should, ideally, be equipped with an overrun clutch. To avoid damage to the brake when operating high inertia implements, hold down the switch (1), to disengage the brake and allow the implement to come to rest naturally.*

DANGER

To avoid inadvertent movement of the implement, disengage the P.T.O. after each use.



24

TWO-SPEED, SHIFTABLE P.T.O. (EXCEPT NORTH AMERICA)

Generally speaking, P.T.O. driven equipment not having a high power requirement is designed to run at 540 P.T.O. rev/min and will have a 6-spline female coupling. A P.T.O. shaft speed of 540 rev/min is obtained at an engine speed of 1969 rev/min. Equipment that requires very low power to operate may be run in the alternative P.T.O. speed range at a lower engine speed with a consequent reduction in fuel consumption and engine wear.

Equipment having a high power requirement is designed to operate at 1000 P.T.O. rev/min and will be provided with a 21-spline female coupling. With the 21-spline shaft installed, run the engine at 2120 rev/min to provide a P.T.O. speed of 1000 rev/min.

IMPORTANT: *Implements with a high power requirement should be operated with the 1000 rev/min. P.T.O. (21-spline shaft). If it is necessary to use the 6-spline shaft (at 540 rev/min.) to operate implements having a power requirement of more than 75 horsepower, then it is strongly recommended that the implement is fitted with a slip clutch to avoid damage to the P.T.O. output shaft and other tractor components.*

A 6-spline P.T.O. output shaft of 1.375 in. (34.9 mm) diameter is supplied, designed to operate at 540 rev/min.

Dependent upon tractor specification, an alternative 6-spline shaft of 1.75 in. (44.45 mm) diameter and a 21-spline shaft of 1.375 in. (34.9 mm) diameter, designed to operate at 1000 rev/min., may also be supplied with the tractor or is available from your dealer.

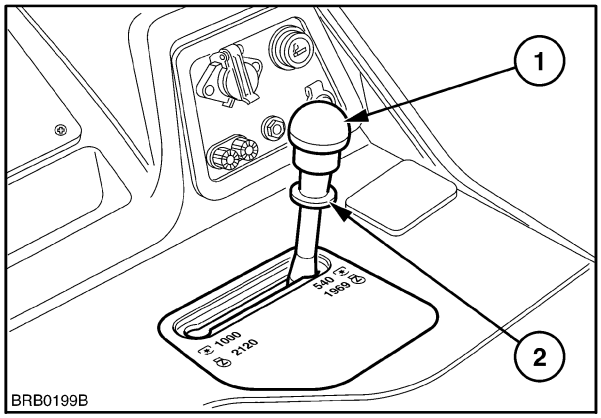
NOTE: *When required, change the P.T.O. shaft to suit the operation and equipment in use, as described under* ‘Changing the P.T.O. Output Shaft’ *on page 3-24*.

Operating

Before engaging the P.T.O., select a P.T.O. ratio, as follows:

With 6-spline shaft installed - Figure 25

- With the tractor **stationary** and the P.T.O. selector knob in the **disengaged** position, select the required speed range by means of the range lever (1). Lift the spring-loaded collar (2) beneath the knob and move the lever rearward to engage the power range or forward to select the economy range.



25

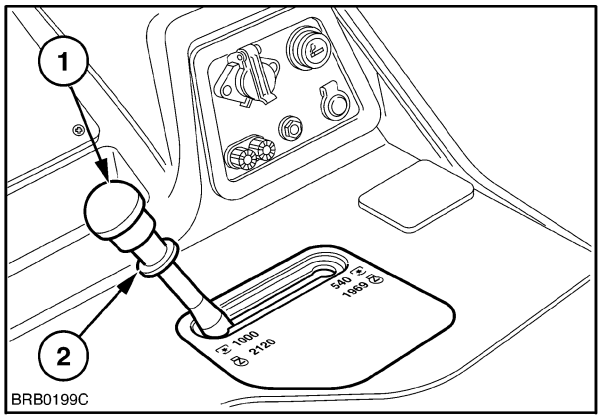
Engine and P.T.O. shaft speeds are as follows:

Range Lever Position	Engine Speed (rev/min)	P.T.O. Speed (rev/min)
Fully rearward (6-spline shaft)	1969	540
Fully forward (6-spline shaft)	1145 (light operations only)	540

IMPORTANT: *The P.T.O. range lever cannot be moved until the spring-loaded collar beneath the knob is lifted. This feature is incorporated to prevent inadvertent selection of the economy range which could result in overspeeding of a P.T.O. driven implement.*

With 21-spline shaft installed - Figure 26

- With the tractor **stationary** and the P.T.O. selector knob in the **disengaged** position, lift the spring-loaded collar (2), beneath the knob, and move the lever (1) fully forward. This will provide a P.T.O. speed of 1000 rev/min at 2120 engine rev/min.

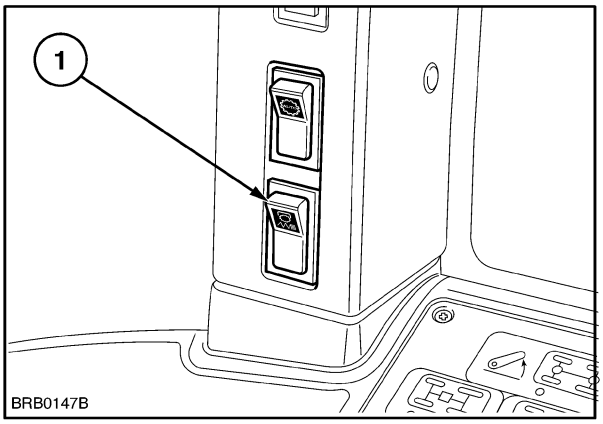


26

NOTE: *The P.T.O. range lever should always be in the forward position when the 21-spline shaft is installed. If you only ever operate with a 21-spline shaft, leave the range lever in the forward position.*

With 6- or 21-spline shaft installed - Figure 27

IMPORTANT: *To avoid shock loads to the P.T.O., reduce engine speed to approximately 1000 rev/min when engaging the P.T.O., then increase engine speed by means of the throttle to obtain the required P.T.O. speed. Use the 'soft start' engagement feature for heavy, P.T.O.-driven equipment, to ensure smooth take up of the drive. Press in the top of the switch (1), to engage 'soft start'.*

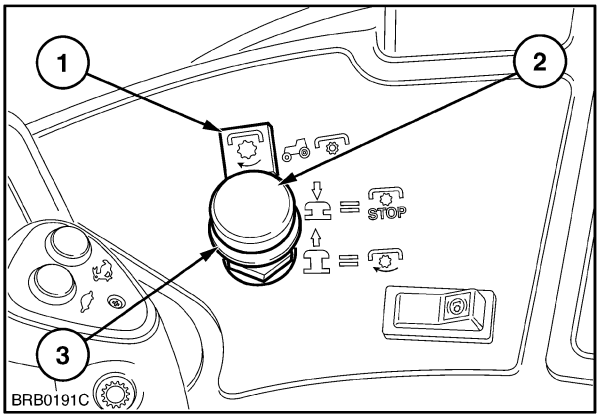


27

Figure 28

With the engine running at 1000 rev/min. or less, press the knob (2) and lift the collar (3) and knob up to engage the P.T.O. The knob will remain up while the P.T.O. is engaged and the adjacent warning light (1) will be illuminated.

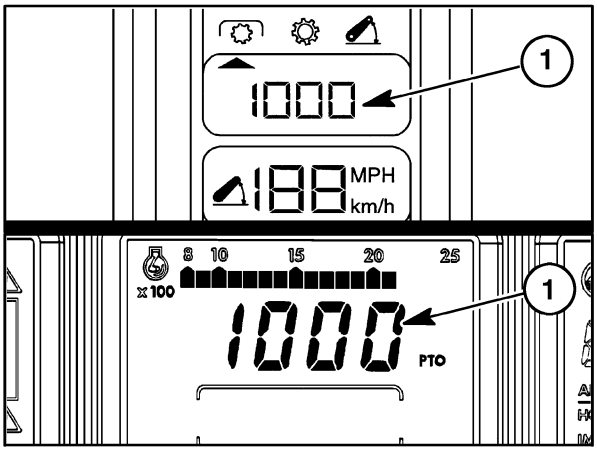
To disengage the P.T.O., press the P.T.O. selector knob (2), down.



28

NOTE: *If the engine is stopped, the P.T.O. will not operate when the engine is restarted until the P.T.O. knob is reset. Return the selector knob manually to the 'off' position (by pressing the knob down) then re-engage the P.T.O., as previously described.*

IMPORTANT: *Although the P.T.O. may be engaged or disengaged with the tractor moving or stationary,* ***do not*** *attempt to change from one P.T.O. speed range to another unless the tractor is stationary and the P.T.O. disengaged - selector knob (2), fully down.*



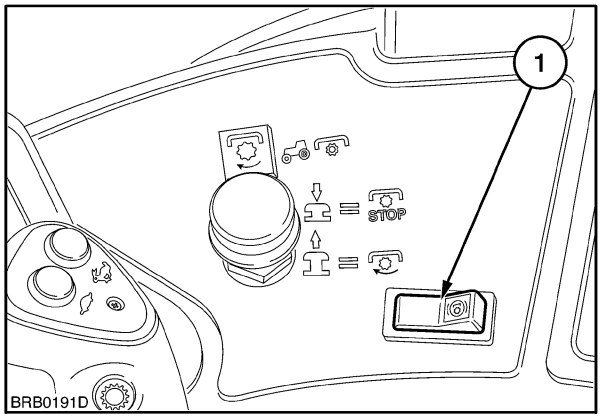
29

Figure 29

NOTE: *If your tractor has an analogue/digital or electronic instrument panel, the P.T.O. shaft speed (1) can be displayed. If overspeeding of the P.T.O. occurs (i.e. P.T.O. speed exceeds 630 rev/min) the light (1) Figure 28 will flash for 5 seconds, then remain steady. When the 1000 rev/min shaft is in use, the light will also flash (but may be ignored) as P.T.O. shaft speed passes through the 630 rev/min range. The light will flash again at 1170 P.T.O. rev/min to indicate that overspeeding has occurred in the 1000 rev/min P.T.O. range.*

Figure 30

IMPORTANT: *An automatic P.T.O. brake is installed to stop shaft rotation quickly when the P.T.O. is disengaged. To avoid overstressing the P.T.O. brake, slow down the implement by reducing engine speed* ***before*** *disengaging the P.T.O. This is particularly important with implements having a high inertia. Such implements should, ideally, be fitted with an overrun clutch. To avoid damage to the brake when operating high inertia implements, hold down the switch (1), to disengage the brake and allow the implement to come to rest naturally.*



30

⚠ DANGER ⚠

To avoid inadvertent movement of the implement, disengage the P.T.O. after each use.

THREE-SPEED, SHIFTABLE P.T.O. (EXCEPT NORTH AMERICA)

Generally speaking, P.T.O. driven equipment not having a high power requirement is designed to run at 540 P.T.O. rev/min and will have a 6-spline female coupling. A P.T.O. shaft speed of 540 rev/min is obtained at an engine speed of 1969 rev/min. Equipment that requires very low power to operate may be run in the alternative P.T.O. speed range at a lower engine speed with a consequent reduction in fuel consumption and engine wear.

Tractors with 3-speed P.T.O. have the advantage of running P.T.O.-driven equipment at 750 rev/min at full power or at 540 rev/min at a lower engine speed. See the table on the following page for P.T.O. and engine speeds.

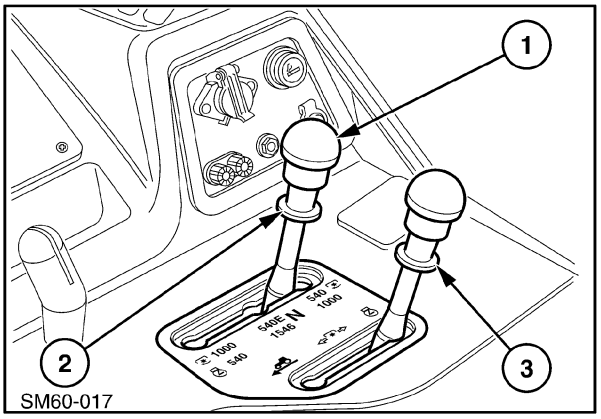
Equipment having a high power requirement is designed to operate at 1000 P.T.O. rev/min and will be provided with a 21-spline female coupling. With the 21-spline shaft installed, run the engine at 2120 rev/min to provide a P.T.O. speed of 1000 rev/min.

IMPORTANT: *Implements with a high power requirement should be operated with the 1000 rev/min. P.T.O. (21-spline shaft). If it is necessary to use the 6-spline shaft (at 540 rev/min.) to operate implements having a power requirement of more than 75 horsepower, then it is strongly recommended that the implement is fitted with a slip clutch to avoid damage to the P.T.O. output shaft and other tractor components.*

A 6-spline P.T.O. output shaft of 1.375 in. (34.9 mm) diameter is supplied, designed to operate at 540 rev/min.

Dependent upon tractor specification, an alternative 6-spline shaft of 1.75 in. (44.45 mm) diameter and a 21-spline shaft of 1.375 in. (34.9 mm) diameter, designed to operate at 1000 rev/min., may also be supplied with the tractor or is available from your dealer.

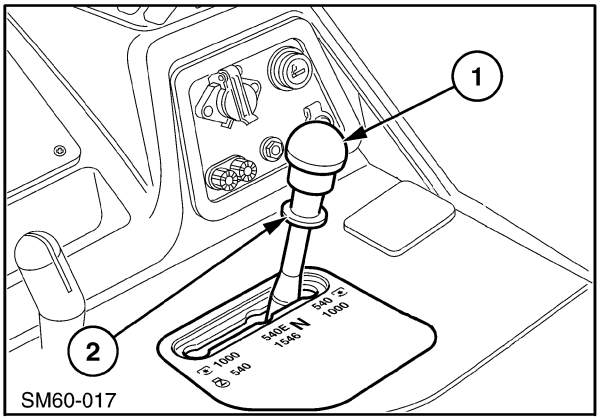
NOTE: *When required, change the P.T.O. shaft to suit the operation and equipment in use, as described under* 'Changing the P.T.O. Output Shaft' *on page 3-24*.



31

Figure 31

IMPORTANT: *If your tractor has the optional ground drive P.T.O., an additional lever (3) is provided. To prevent damage to the P.T.O. driveline, ensure that this lever is pulled fully* ***rearward****, as shown, before operating the engine-driven P.T.O. (The forward position is used to engage ground drive P.T.O.).*



32

Operating

Before engaging the P.T.O., select a P.T.O. ratio, as follows:

With 6-spline shaft installed - Figure 31 or 32:

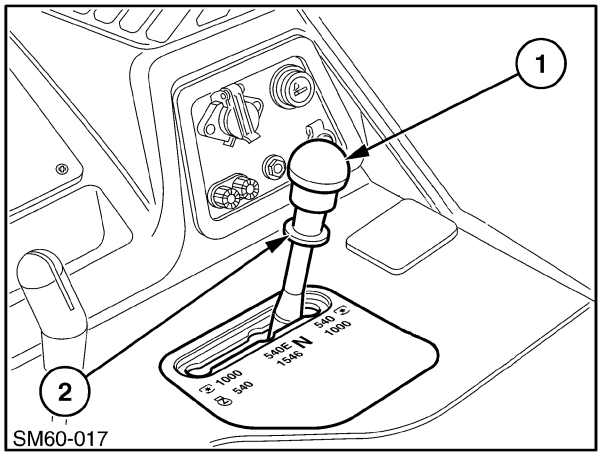
- With the tractor **stationary** and the P.T.O. selector knob in the **disengaged** position, select the required speed range by means of the range lever (1). Lift the spring-loaded collar (2) beneath the knob and move the lever fully rearward to engage the power range, forward to select the intermediate range or fully forward for the economy range.

Operating - Figure 33 or 34

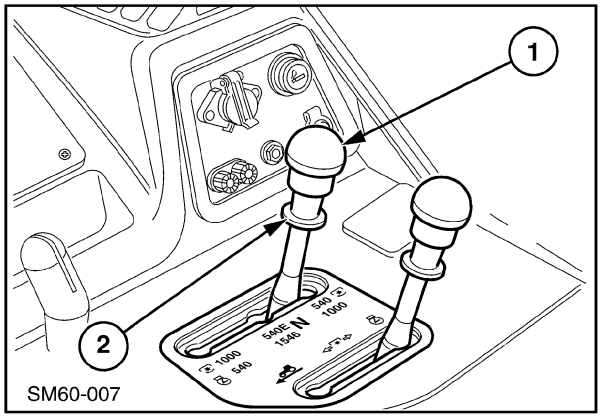
NOTE: *The 3-speed P.T.O. range lever has a neutral position, denoted by the letter 'N'. See Figure 33 or 34.*

Engine and P.T.O. shaft speeds are as follows:

Range Lever Position	Engine Speed (rev/min)	P.T.O. Speed (rev/min)
Fully rearward (6-spline shaft)	1969	540
Intermediate position (6-spline shaft)	1546	540
Intermediate position (6-spline shaft)	2148	750
Fully forward (6-spline shaft)	1145 (light operations only)	540



33



34

IMPORTANT: *The P.T.O. range lever cannot be moved until the spring-loaded collar beneath the knob is lifted. This feature is incorporated to prevent inadvertent selection of the economy range which could result in overspeeding of a P.T.O. driven implement.*

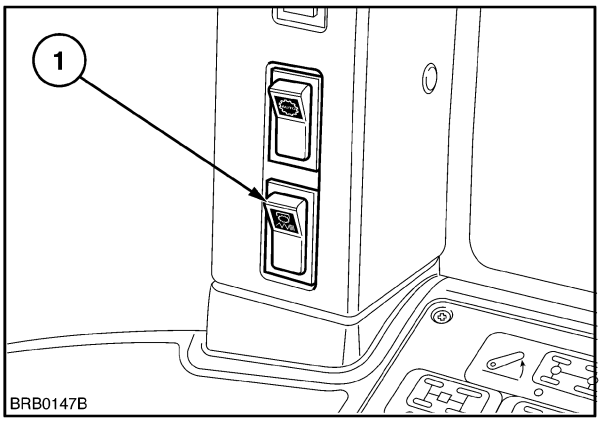
With 21-spline shaft installed:

- With the tractor **stationary** and the P.T.O. selector knob in the **disengaged** position, select the required speed range by means of the range lever (1) Figure 33 or 34. Lift the spring-loaded collar (2) beneath the knob and move the lever fully forward. This will provide a P.T.O. speed of 1000 rev/min at 2120 engine rev/min.

NOTE: *The P.T.O. range lever should always be in the fully forward position when the 21-spline shaft is installed.*

With 6- or 21-spline shaft installed - Figure 35

IMPORTANT: *To avoid shock loads to the P.T.O., reduce engine speed to approximately 1000 rev/min when engaging the P.T.O., then increase engine speed by means of the throttle to obtain the required P.T.O. speed. Use the 'soft start' engagement feature for heavy, P.T.O.-driven equipment. to ensure smooth take up of the drive. Press in the top of the switch (1), to engage 'soft start'.*

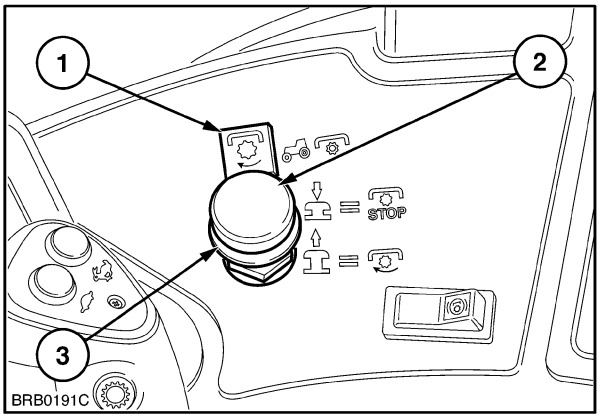


35

Figure 36

With the engine running at 1000 rev/min. or less, press the knob (2) and lift the collar (3) and knob up to engage the P.T.O. The knob will remain up while the P.T.O. is engaged and the adjacent warning light (1) will be illuminated.

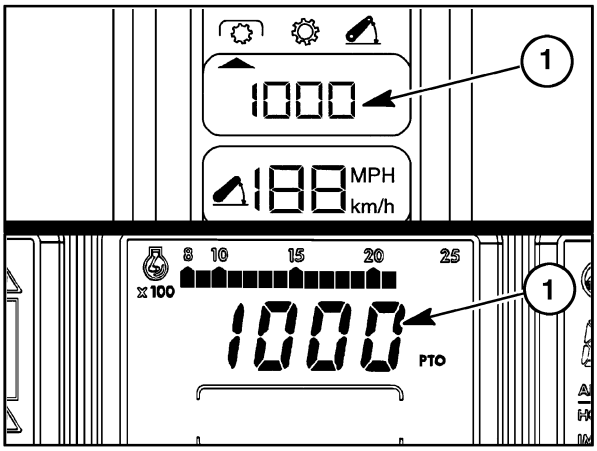
To disengage the P.T.O., press the P.T.O. selector knob (2) down.



36

NOTE: *If the engine is stopped, the P.T.O. will not operate when the engine is restarted until the P.T.O. knob is reset. Return the selector knob manually to the 'off' position (by pressing the knob down) then re-engage the P.T.O., as previously described.*

IMPORTANT: *Although the P.T.O. may be engaged or disengaged with the tractor moving or stationary,* ***do not*** *attempt to change from one P.T.O. speed range to another unless the tractor is stationary and the P.T.O. disengaged - selector knob (2), fully down.*



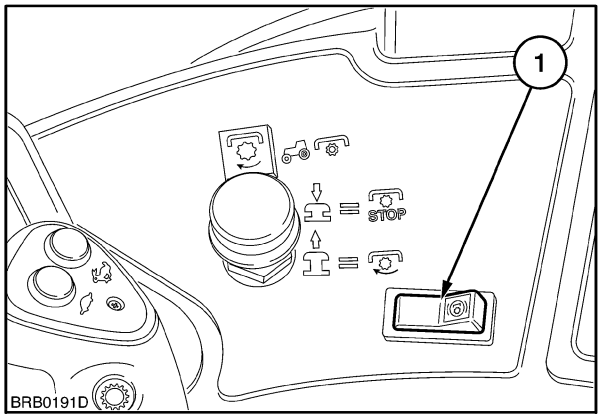
37

Figure 37

NOTE: *If your tractor has an analogue/digital or electronic instrument panel, the P.T.O. shaft speed (1) can be displayed. If overspeeding of the P.T.O. occurs (i.e. P.T.O. speed exceeds 630 rev/min) the light (1) Figure 36, will flash for 5 seconds, then remain steady. When the 1000 rev/min shaft is in use, the light will also flash (but may be ignored) as P.T.O. shaft speed passes through the 630 rev/min range. The light will flash again at 1170 P.T.O. rev/min to indicate that overspeeding has occurred in the 1000 rev/min P.T.O. range.*

Figure 38

IMPORTANT: *An automatic P.T.O. brake is installed to stop shaft rotation quickly when the P.T.O. is disengaged. To avoid overstressing the P.T.O. brake, slow down the implement by reducing engine speed* ***before*** *disengaging the P.T.O. This is particularly important with implements having a high inertia. Such implements should, ideally, be fitted with an overrun clutch. To avoid damage to the brake when operating high inertia implements, hold down the switch (1), to disengage the brake and allow the implement to come to rest naturally.*



38

⚠ DANGER ⚠

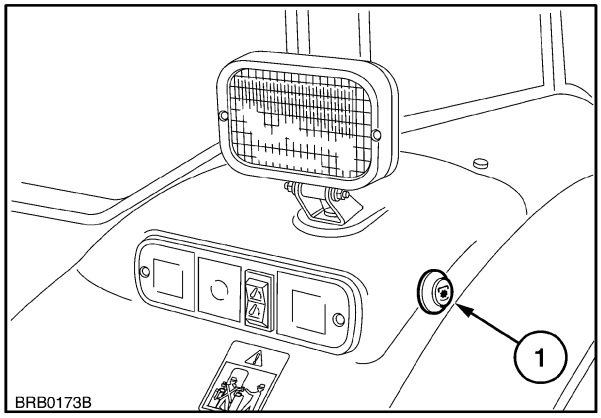
To avoid inadvertent movement of the implement, disengage the P.T.O. after each use.

EXTERNAL P.T.O. CONTROLS (except N. America) - Figure 39

An optional, fender-mounted P.T.O. switch (1), may be installed on the outer surface of both rear fenders to aid alignment of the P.T.O shaft splines with equipment and facilitate stationary P.T.O. operations.

With the engine running, touch the switch momentarily to cause the P.T.O. shaft to index round to align the shaft splines. If the switch is pressed for less than 5 seconds, the shaft will stop turning when the switch is released.

Press and hold in the switch for more than 5 seconds and the P.T.O. will operate continuously. Press the switch again to stop the P.T.O. Alternatively, the P.T.O. may be stopped by means of the in-cab controls, as previously described.



39

NOTE: *The warning light, on the P.T.O. control panel, will illuminate when the P.T.O. is engaged, momentarily or permanently.*

NOTE: *The P.T.O. may be engaged or disengaged-from the fender switch, whether the in-cab control is in the on or off position.*

NOTE: *Simultaneous operation, within two seconds, of in cab and external P.T.O. controls will result in error code P38 showing. A 10 second delay will also occur before P.T.O. control operation will recommence.*

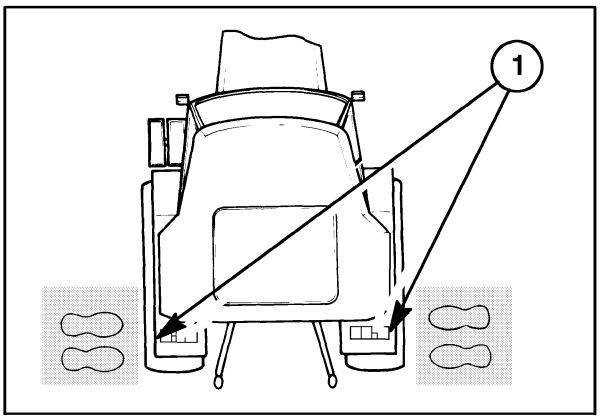
NOTE: *The soft start function, if selected, will operate irrespective of whether the P.T.O. is engaged from inside the cab or from a fender switch.*

CAUTION

Before leaving the tractor to operate the external Power Take Off switches:

- *Move the gearshift levers to neutral.*
- *Disengage the P.T.O.*
- *Apply the parking brake.*

With the engine running, move the hand throttle lever to the low idle position (fully rearwards).



40

Figure 40
The operator must only activate the external Power Take Off switches (1) while standing to the side of the tractor (outboard of the rear tyres). To aviod damage to implement or tractor, operation of the in cab and external P.T.O. switches should **not** be carried out simultaneously.

WARNING

Before using the external Power Take Off switches, ensure that no person or object is in the area of the implement, 3-point linkage or P.T.O.shaft.

Never operate the external switches while standing:

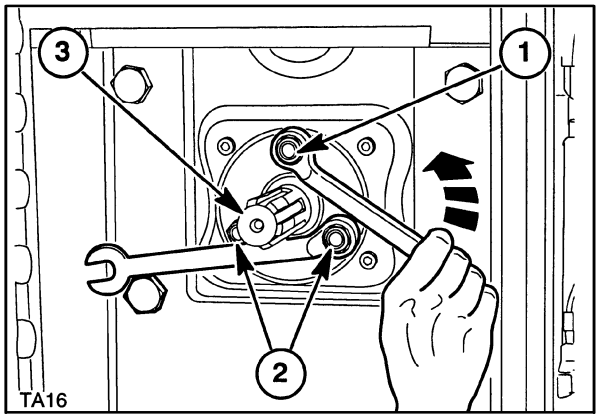
- *Directly behind the tractor or tyres.*
- *Between the lower links.*
- *On or near the implement.*
- *Never extend arms, legs, any part of the body or any object into the area near the 3-point linkage, P.T.O. shaft or implement while operating the external switch.*
- *Never have an assistant working the opposite set of controls.*
- *When moving to the opposite set of controls, move around the tractor or implement.*
- *Do not cross between the implement and tractor.*

CHANGING THE P.T.O. OUTPUT SHAFT - Figure 41

Unscrew the three nuts (1) and (2) and remove the shaft assembly (3). To loosen the nuts, position a ring spanner on one of the nuts so that it is braced against a convenient projection. Use a second spanner, as shown, to loosen the adjacent nut.

Ensure that the replacement shaft is thoroughly clean before installation. Following the removal procedure, in reverse, tighten the three securing nuts to a torque of 162 Nm. (120 lbf. ft).

Protect the removed shaft by wrapping in a clean cloth and place in the tool box.

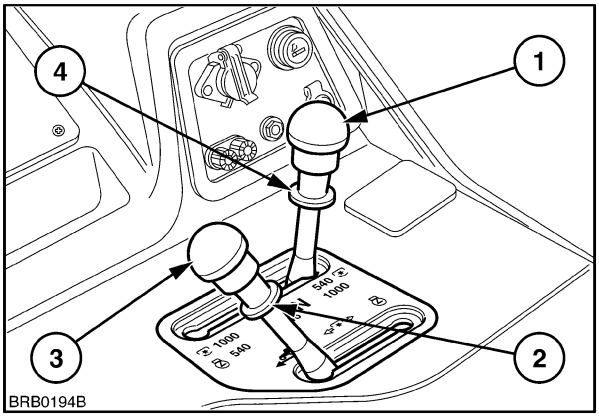


41

GROUND DRIVE P.T.O. (except North America) - Figure 42

Three-speed ground drive P.T.O. is available on all models, except TM165 tractors, in conjunction with the 3-speed engine-driven, shiftable P.T.O. previously described. Ground drive P.T.O. speed is directly related to rotation of the rear wheels rather than engine speed.

Three speed ranges are provided, selected by means of the P.T.O. range lever (1). An additional lever (3) is provided to select ground drive.



42

To engage ground drive P.T.O.:

With the tractor **stationary**, ensure that the P.T.O. is **disengaged** by pressing the selector knob down, Figure 36 (2). Lift the collar (4), then move the lever (1) to the required speed range. Lift the collar (2) and move the ground drive/engine drive selector lever (3) fully forward, as shown.

Fully depress the clutch pedal, select a transmission gear and open the throttle to increase engine speed. Allow the clutch pedal to rise. Initial movement of the clutch pedal will cause the tractor to move and the P.T.O. shaft (and attached equipment) to rotate.

The speed of rotation of the P.T.O. shaft is directly related to rotation of the rear wheels. Shaft revolutions for each revolution of the rear wheels are as shown in the table on the right.

	P.T.O. shaft revs. per wheel rev.	
	TM115 TM125	**TM135 TM150**
540 P.T.O. range engaged (lever fully rearward)		
Synchro Command	13.9	14.4
Dual, Range and Power Command	15.4	16.0
750 P.T.O. range engaged (lever in central position)		
Synchro Command	17.6	18.4
Dual, Range and Power Command	19.6	20.4
1000 P.T.O. range engaged (lever fully forward)		
Synchro Command	23.8	24.8
Dual, Range and Power Command	26.5	27.6

FRONT P.T.O. AND HYDRAULIC POWER LIFT (where fitted)

Tractors with four wheel drive may be equipped with an engine-driven P.T.O. and front hydraulic lift These features are available as a factory installed option or dealer installed accessory.

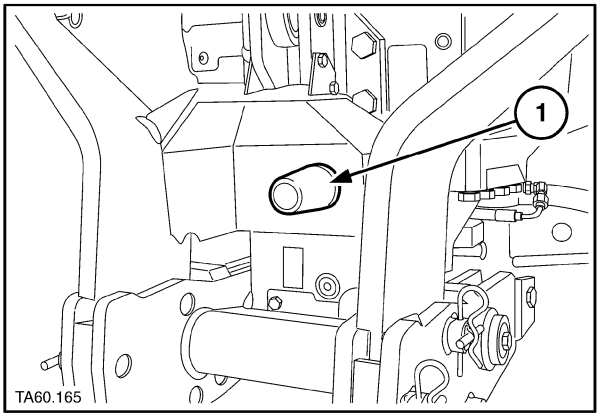
FRONT P.T.O.

The front power take-off (P.T.O.) transfers engine power directly to front-mounted equipment via a splined shaft. The P.T.O. may be fitted with either a 6-spline or a 21-spline shaft that rotates anti-clockwise (as viewed from the front). These shafts are not inter-changeable.

FRONT P.T.O. - Figure 43

A plastic cap (1) is provided over the P.T.O. shaft. Pull the cap to remove.

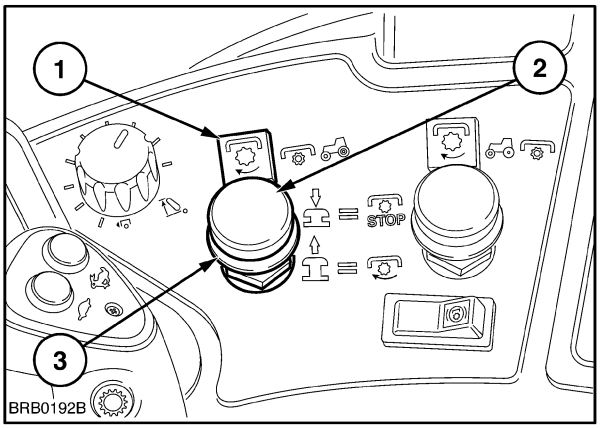
The front P.T.O. is electro-hydraulically operated and is activated by a selector knob on the right-hand console, similar to the rear P.T.O.



43

FRONT P.T.O. - Figure 44

With the engine running at 1000 rev/min. or less, press the knob (2) and lift the collar (3) and knob up to engage the P.T.O. The knob will remain up while the P.T.O. is engaged and the adjacent warning light (1) will be illuminated. Open the throttle to increase engine speed to 2100 rev/min and provide a P.T.O. shaft speed of 1000 rev/min. To disengage the P.T.O., press the P.T.O. selector knob (2), down.



44

NOTE: *If the engine is stopped, the P.T.O. will not operate when the engine is restarted until the P.T.O. knob is reset. Return the selector knob manually to the 'off' position (by pressing the knob down) then re-engage the P.T.O., as previously described.*

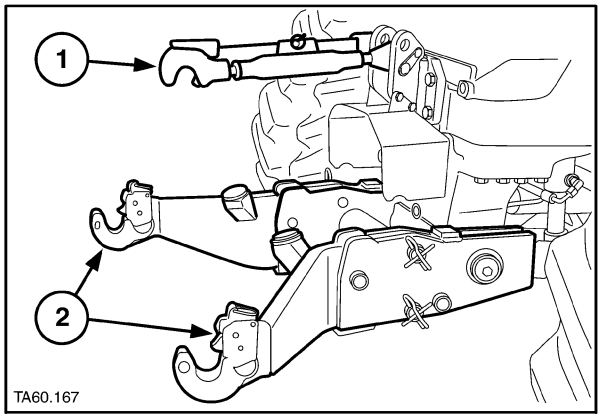
⚠ DANGER ⚠

To avoid inadvertent movement of the implement, disengage the P.T.O. after each use.

FRONT HYDRAULIC POWER LIFT (where fitted)

Figure 45

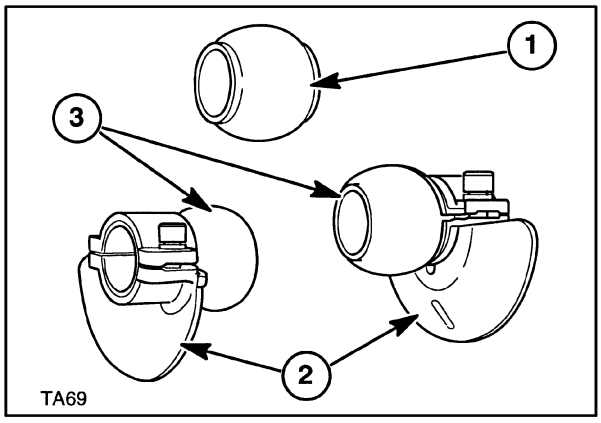
The optional Walterscheid hitch, installed at the front of the tractor, consists of an adjustable top link (1) and a pair of folding lower links (2). The top link and the lower links have open claw ends that permit rapid coupling and uncoupling of implements. The claws are equipped with self-locking latches to ensure positive retention of the tractor linkage to the implement.



45

Figure 46

Three ball-bushings are supplied for installation on the implement, if required. The ball-bushing with projecting lips (1) should be installed on the implement upper hitch pin. The two plain ball-bushings (3) with their detachable guides (2) should be installed on the implement lower hitch pins.



46

Figures 47,48

The front hitch may be controlled through the standard remote valves, or by two additional dedicated mid-mounted remote valves.

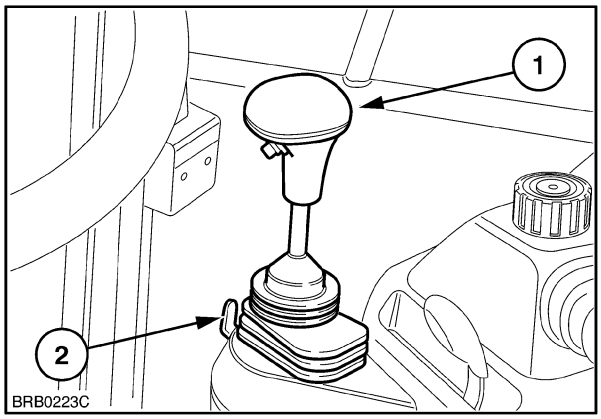
With rear remote valves:-

Utilising valves III or IIII at the rear of the tractor, actuation of the front hitch may be controlled via the remote valve levers. As an alternative, the levers operating remote valves III or IIII may be replaced by a joystick (1) located at the front of the right-hand console.

With mid mounted remote valves:-

The mid mount remote valve pack is controlled by a joystick (1) located at the front of the right-hand console and provides two additional valves dedicated to the front hitch.

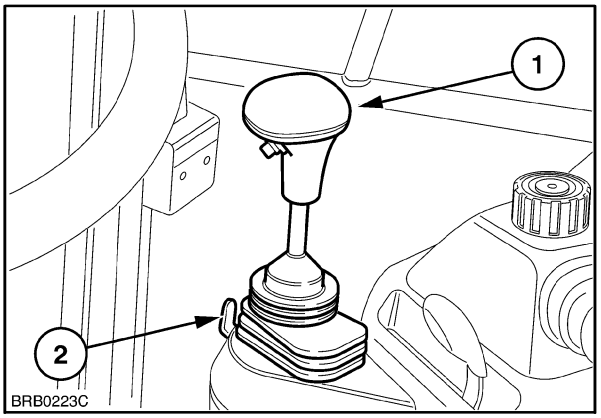
Moving the joystick back and forth will raise and lower the hitch and provide a float position. Lateral movement of the joystick controls oil flow from the second valve to a set of couplers located adjacent to the front linkage.



47

The joystick control also has the advantage of being able to operate two functions simultaneously by moving it diagonally.

The push/pull lever (2) is used to lock the joystick in the neutral position and avoid accidental actuation of a remote valve. Push the lever in to lock the joystick in neutral. Push the lever in to lock the joystick in neutral. Pull the lever out when it is required to operate the joystick.



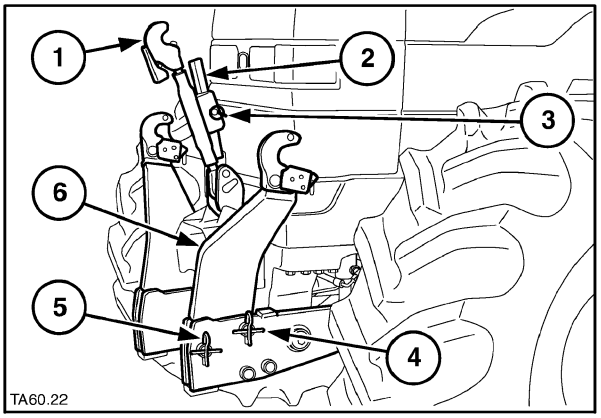
48

Transport Position - Figure 49 The top link and lower links should be pinned in the transport position when not in use. Raise the top link (1) to the vertical position and secure to the bar (2) with the linch pin (3).

Each lower link pivots about the pin (4). This pin should not be removed unless it is required to remove the lower links. Remove the lower pin from the lower link assembly and raise the lower link (6) to the vertical position, as shown. Insert the pin into the upper, front hole (5) when the holes in the inner and outer links are correctly aligned. Secure with the 'R' clip.

When the front hitch is not specified, the joystick may be installed to operate other equipment such as front loaders, sprayers, fertilizer spreaders, etc.

The joystick may also connected by cables to remote control valves III and IIII (CCLS remote control valves only) in place of the two separate levers normally fitted.



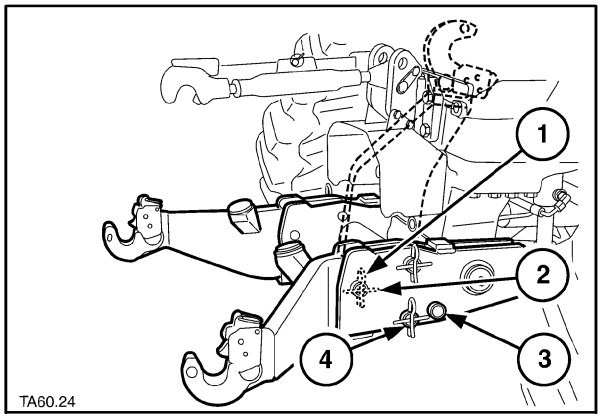
49

Figure 50
With the lower links in the transport position, remove the 'R' clip (1), pull out the pin (2) and manually lower the lower link down to the operating position, as shown. Install the removed pin in one of the holes (3) or (4), as required.

When installed in the rear hole (3), the lower link will be locked as a rigid unit. If the pin is installed in the front hole (4), as shown, the lower link will be allowed to move up and down freely (float) through a range of approx. 75 mm (3 in). Secure the pin with the 'R' clip.

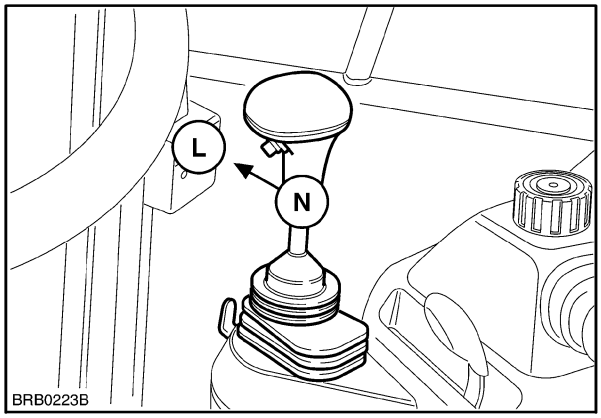
Repeat on the other lower link, ensuring that both lower links are set up the same, i.e., both are locked as rigid units or both are allowed to float.

NOTE: *With the lower links pinned in the float position, the left- and right-hand sides of the implement can move up and down independently to allow for operation on uneven surfaces. In addition, the remote control valve float function will allow the whole implement to move up or down as it passes over uneven ground.*



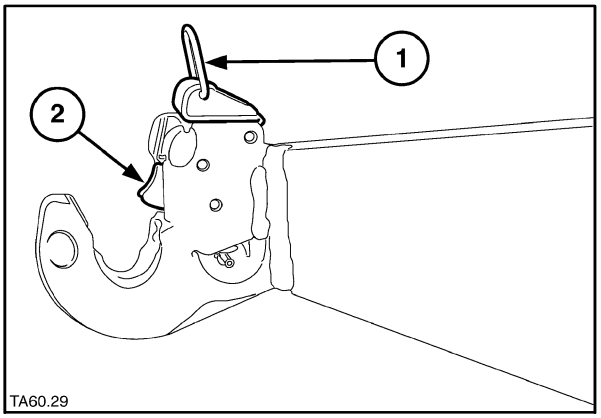
50

Coupling Implement to Tractor - Figure 51
Start the engine. Move the joystick from neutral (N) to lower (L). Lower the hitch until the lower links are just clear of the ground. Position the tractor so that the open claw ends are beneath the implement hitch pins.



51

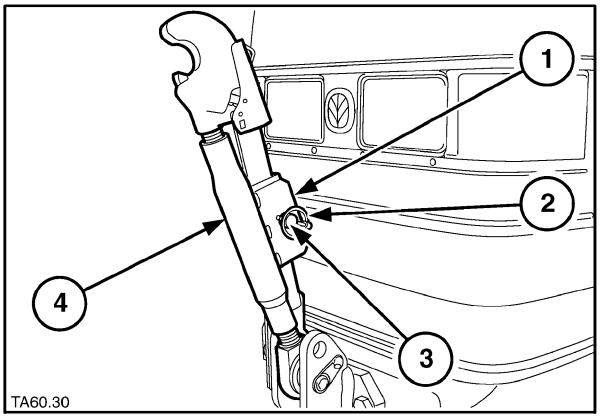
Figure 52
Ensure that the self-locking latch (2) on each claw is projecting from the housing, as shown. If the latch is retracted into the housing, pull the ring (1) forward and the latch will spring out.



52

Move the joystick fully rearward to raise the lower links until the claw couplers engage the ball-bushings. An audible click will be heard as the self-locking latches engage the ball-bushings on the implement. The joystick should be returned to the neutral position before the lower links start to lift the implement from the ground.

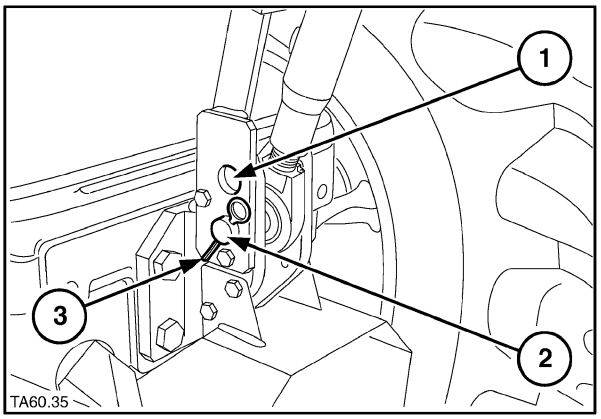
Figure 53
Remove the linch pin (2) and move the top link to the left to clear the pin (3) on the transport bar. Increase or decrease top link length, as necessary, by rotating the threaded centre section (4) using the plate (1) as leverage. The top link has a similar claw end to the lower links. Lower the top link claw onto the upper implement ball-bush and press down until the latch is heard to engage.



53

The implement supports, where fitted, may now be removed or retracted and the implement supported on the front linkage.

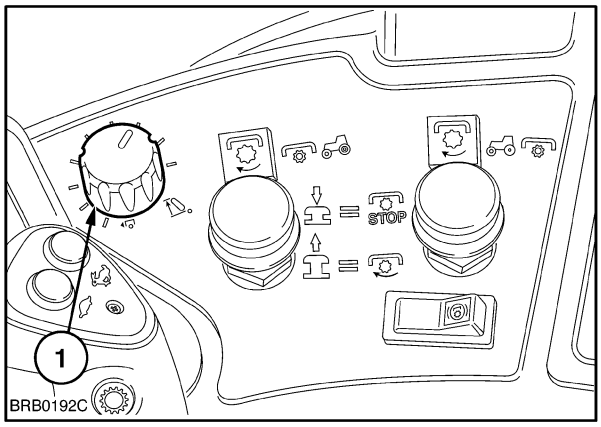
Adjustments - Figure 54
The top link is connected to the bracket with the pin (2) secured by the split pin (3). Two holes are provided in the top link bracket for location of the top link. Use the top hole (1) for maximum lift capacity. Use the lower hole, as shown, for the best ground penetration and greatest implement height, when raised.



54

Figure 55

Height limit control is provided by a rotary knob (1) on the right-hand console. Fully clockwise is maximum height. Turn anti-clockwise for minimum height. In the illustration, the knob is shown turned off in the fully anti-clockwise (detented) position.



55

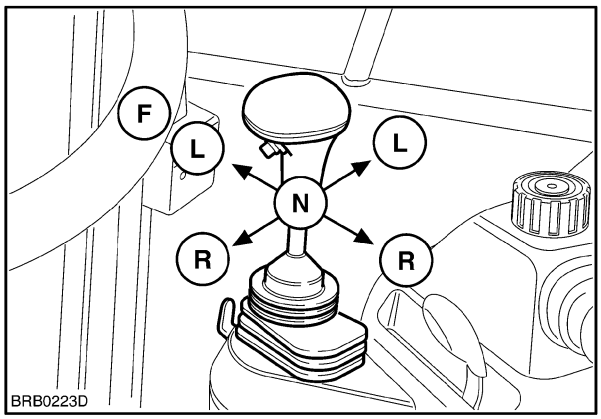
NOTE: *The height limit setting is affected by the oil flow through the system. For example, if the flow control setting is set to maximum and engine speed is high then hitch height may be up to 100 mm (4 in.) higher than would be achieved if engine speed and oil flow rate were low.*

Operating - Figure 56

Pull the joystick rearwards (R) to raise the implement. When the hydraulic lift reaches the height set by the height limit rotary control (Figure 55) the joystick will return automatically to neutral (N). Alternatively, the hydraulic lift will stop raising when the joystick is manually returned to the neutral position.

Push the joystick forward to the 'lower' position (L) which will cause the implement to lower to the ground.

Further forward movement of the joystick will select 'float' (F) which will allow the cylinder to extend or retract freely.



56

The joystick may also be moved from side (R) to side (L) to operate a second cylinder connected to the valve block. There is no float position with this function.

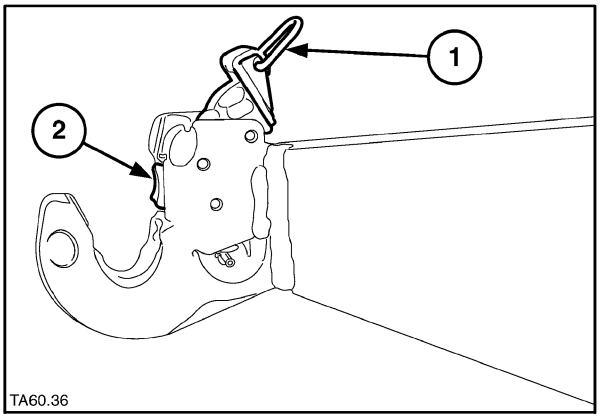
The joystick has the added advantage of being able to operate two cylinders simultaneously by moving it diagonally.

Uncoupling Implement from Tractor – Figure 57
Using the joystick, lower the implement to the ground, ensuring that it cannot fall when disconnected from the front hitch. Use the implement supports (where fitted).

Pull back the lever on the top link to release the claw from the implement upper hitch pin.

Pull the ring (1) on both lower links fully rearwards. The lever will lock in position with the latch (2) retracted, as shown. This will allow the links to clear the ball-bushings on the implement lower hitch pins when the links are lowered fully.

Fully lower the lower links using the joystick and reverse the tractor clear of the implement.



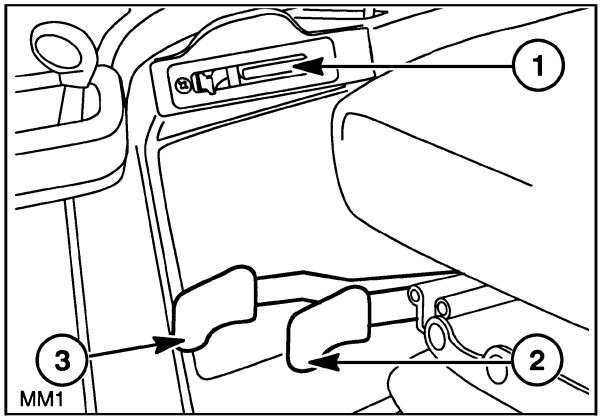
57

MECHANICAL LOWER LINK SENSING HYDRAULICS

INTRODUCTION - Figure 58

The hydraulic system described here mechanically senses changes in the draft loading via the lower links of the 3-point linkage. The system allows the operator to select Position Control, Draft Control, a combination of the two or float.

The system is controlled by the Draft Control lever (2) the Position Control lever (3) and the fast raise button (1). The fast raise button will fully raise the 3-point linkage (and attached implement) independently of the Position or Draft Control levers.



58

Position Control provides accurate control of implements such as sprayers, rakes, mowers, etc., that operate above the ground. Once set, Position Control will maintain the selected implement height.

Draft Control is most suitable for mounted or semi-mounted implements operating in the ground. Changes in the working depth or changes in soil resistance will cause the draft loading on the implement to increase or decrease.

Pre-operation Checks - Figure 58

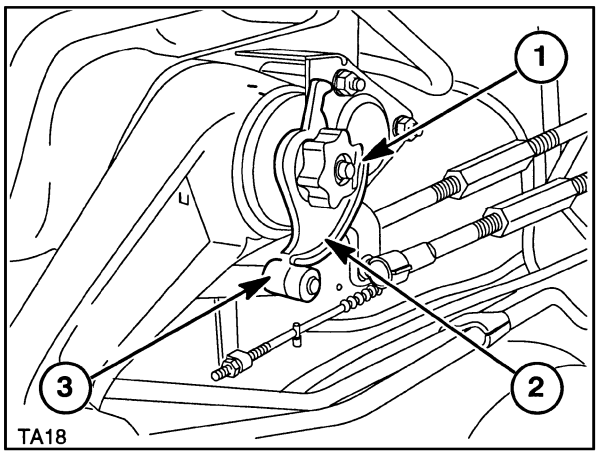
⚠ DANGER ⚠

Before starting the engine, always ensure that the fast raise button (1) is pushed in, as shown, to prevent inadvertent raising of the 3-point linkage.

IMPORTANT: *Some mounted or semi-mounted equipment may interfere with and damage the cab. To avoid the possibility of cab damage, check for adequate clearance by slowly raising the equipment using the* ***Position Control*** *lever (2). If any part of the equipment comes closer than 100 mm (4 in.) to the cab, stop raising. Stop the engine, lower equipment to the ground and adjust the height limiter cam.*

Figure 59

The height limiter cam is on the right-hand end of the hydraulic rocker shaft. Loosen the clamp knob (1) and turn the cam anti-clockwise to decrease implement height. Turn in a clockwise direction to increase implement height. The cam (2) is shown in contact with the roller (3) at the lowest height position. Tighten the clamp knob after adjustment. To achieve full lift height, turn the cam fully clockwise until it clears the roller.



59

NOTE: *The height limiter cam only affects operation of the fast raise button. When the cam comes into contact with the roller, it cancels the signal from the fast raise button and stops the 3-point linkage from raising further.*

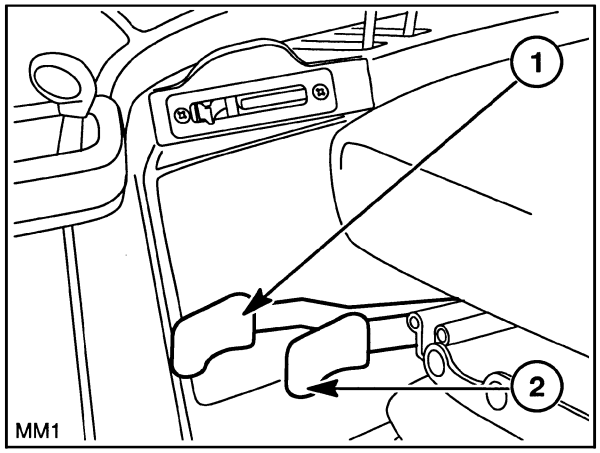
Repeat the previous step to check for implement to cab clearance. If clearance is inadequate, move the cam further in an anti-clockwise direction. When clearance is satisfactory, proceed to operate.

Position Control Operation

IMPORTANT: *Always set the system to Position Control at any time when not actually operating in Draft Control, such as when attaching or transporting equipment or when no equipment is attached.*

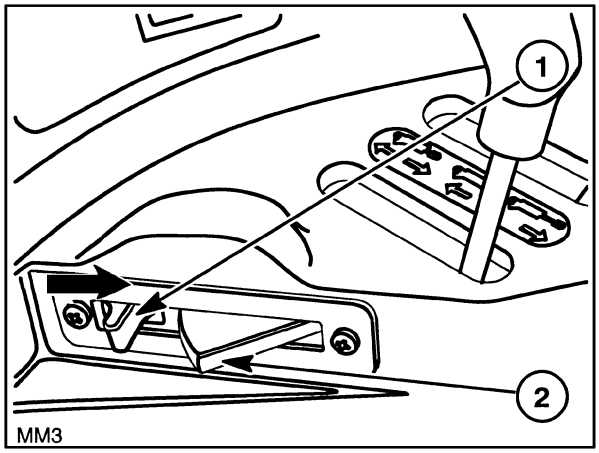
Figure 60

Move the Draft Control lever (2), fully forward in the quadrant. Set the required implement height/depth using the Position Control lever (1). Pull the lever back to raise the implement, push forward to lower. Implement height/depth is relative to the position of the lever in the quadrant.



60

Figure 61
To raise the implement at the end of each pass, or whenever required, move the latch (1) rearward to release the fast raise button. The button (2) will pop out, as shown and the 3-point linkage (and implement) will raise to full lift height (as determined by the height limiter cam setting) without the need to move the Position Control lever.

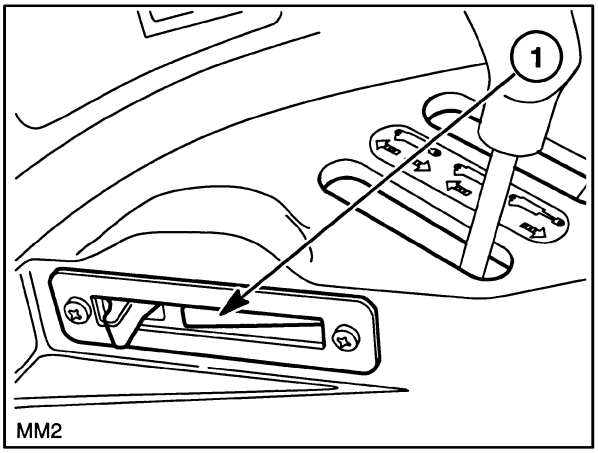


61

Figure 62
To lower the implement, simply press the fast raise button (1) fully in, as shown, and the implement will lower to the height/depth set by the Position Control lever.

⚠ CAUTION ⚠

When transporting equipment on the 3-point linkage, raise the implement using the Position Control lever. The hydraulic system will maintain the equipment at the height set by the Position Control lever and prevent the equipment lowering and becoming damaged, damaging the road surface or causing personal injury.

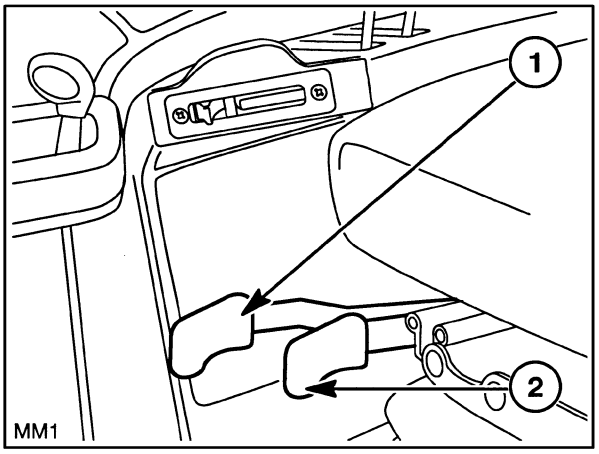


62

Draft Control Operation - Figure 63
When starting work, move the Position Control lever (1) fully forward and lower the implement into work using the Draft Control lever (2). Push the lever forward to increase the draft loading. Pull rearwards to reduce the draft loading. In most circumstances forward movement of the lift control lever will increase implement depth and rearward movement will reduce the depth.

Once set, the tractor hydraulic system will automatically adjust the implement depth to maintain an even pull on the tractor and so reduce wheel slip to a minimum.

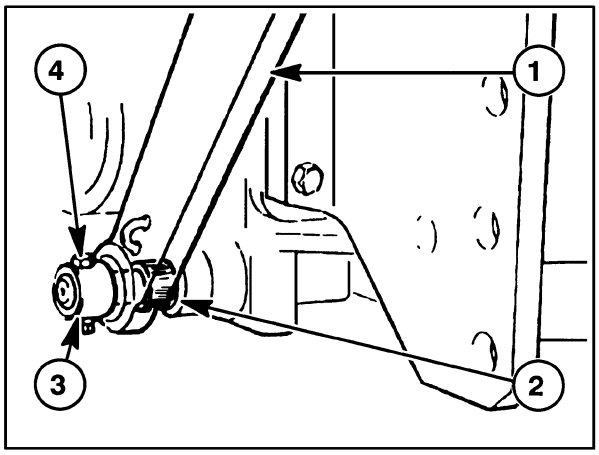
Observe the implement as it pulls through the soil. If the hydraulic system reaction (vertical movement of the implement) is too great or too frequent then system sensitivity may be reduced by adjustment of the sensor bar spacers.



63

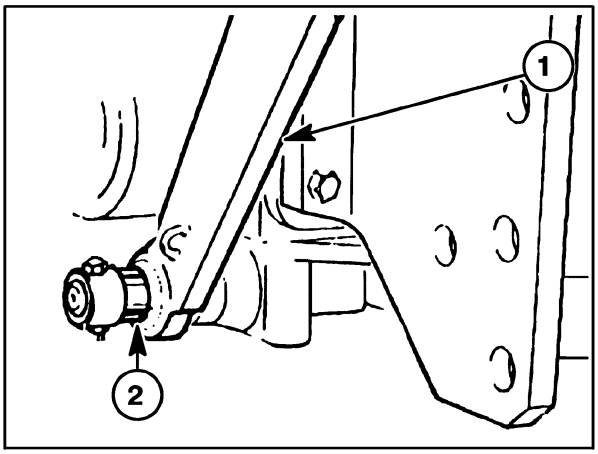
Figure 64
To move a spacer, remove the nut and bolt (4), end stop (3), lower link (1) and spacer (2). Re-install the lower link first, followed by the spacer and end stop. Secure the end stop with the nut and bolt. Tighten the nut securely.

In the illustration the left-hand end of the sensor bar is shown. The spacer (2) is mounted on the sensor bar against the inner face of the lower link (1). This is the most sensitive position, recommended for light implements or light draft loads. To reduce system sensitivity, move the spacers at both ends of the sensor bar to the outside of the lower links.



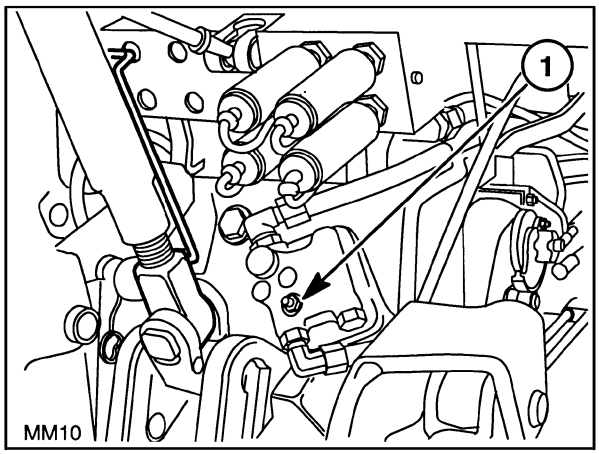
64

Figure 65
In this illustration, the left-hand end of the sensor bar is shown with the spacer (2) mounted against the outer face of the lower link (1). This is the least sensitive position, recommended for heavier implements or heavy draft conditions.



65

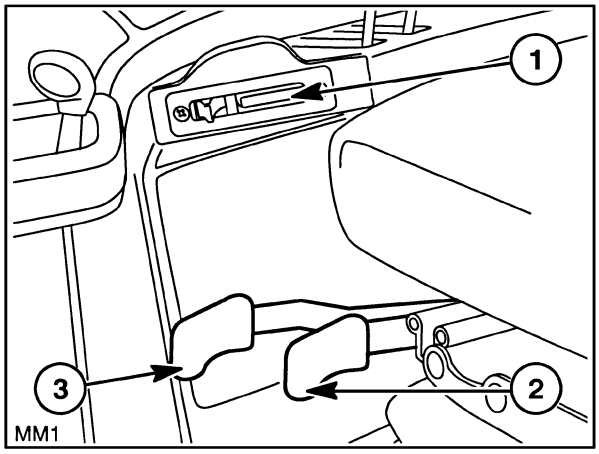
As with Position Control operation, use the fast raise button to raise and lower the 3-point linkage (and implement) at the end of each pass. Do not move the Draft Control lever as this will affect the previously determined setting.



66

Figure 66
A drop rate control valve is provided just above and to the right of the top link mounting bracket. Adjust the valve to change the lowering speed of the implement. Loosen the locknut and turn the screw (1) on the control valve clockwise to increase the lowering speed. Turn anti-clockwise to decrease the speed of lowering.

Combined Position and Draft Control Operation - Figure 67
When starting work, lower the implement to the required depth by means of the Draft Control lever (2), as previously described. Observe the implement as it pulls through the soil.



67

When the implement stabilises at the required depth, ease the Position Control lever (3) back until the lift arms tend to rise. The lift linkage is now operating in Draft Control but the implement is prevented, by the Position Control function, from sinking too far when the draft load reduces.

Float Operation - Figure 67
Move the Position Control lever (3) and the Draft Control lever (2) fully forward. The 3-point linkage will now be free to 'float' or follow the ground contour, a feature useful for scraper blades, etc.

External Hydraulic Power Lift Control - Figure 68

To aid the connection of implements, an external power lift control lever is provided inboard of the rear right-hand fender.

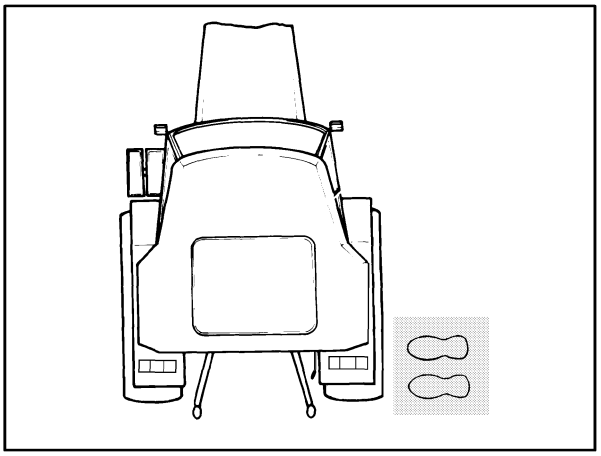
Before leaving the tractor to operate the external power lift control:

- Apply the parking brake
- Move the gearshift levers to neutral
- Disengage the P.T.O.
- Move the Draft Control lever fully forward
- Move the hand throttle lever to the low idle position (fully rearwards)

⚠ WARNING ⚠

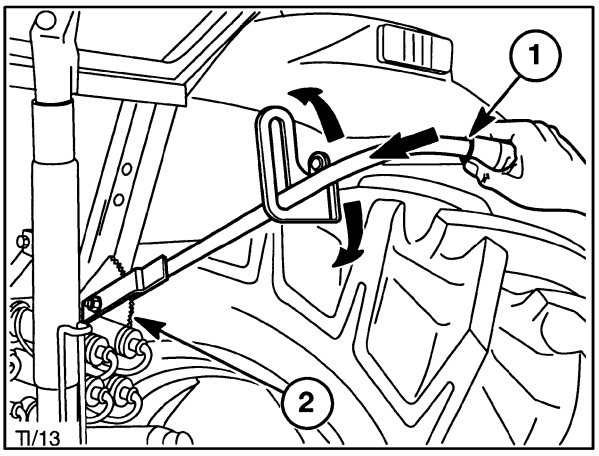
Before using the external hydraulic power lift control, ensure that no person or object is in the area of the implement or 3-point linkage. Never extend arms, legs, any part of the body or any object into the area of the 3-point linkage or implement.
Never operate the external power lift control while standing:

- *Directly behind the tractor or tyres*
- *Between the lower links*
- *On or near the implement*



68

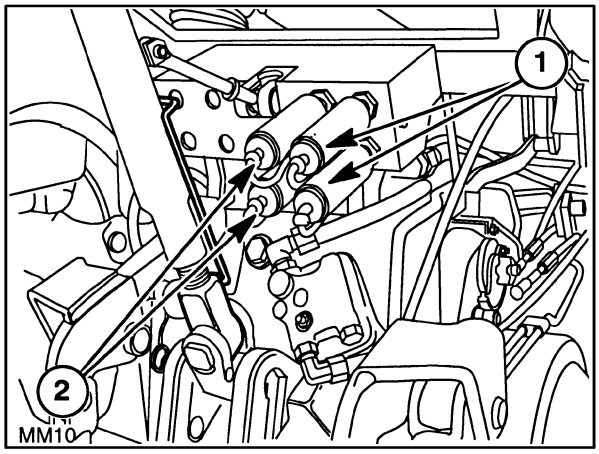
The operator must only activate the external power lift control lever while standing to the right of the tractor, outboard of the rear tyre (the shaded area in Figure 68).



69

Figure 69
Press the lever (1) in, (toward the tractor), to engage the toothed sector (2). Move the lever (and sector) up to raise the lower links, pull down to lower. Each movement of the lever will raise or lower the linkage approximately 80 - 100 mm (3 - 4 in.). Release the lever and re-engage it at a different position in the sector if further adjustment of the linkage is required. When the lower links align with the implement, release the lever and attach the implement to the 3-point linkage in the normal way.

REMOTE CONTROL VALVES - OPEN CENTRE TYPE (where fitted)



70

Description - Figure 70

The remote control valves described here are of the open centre type. Two valves (1) and (2) are shown.

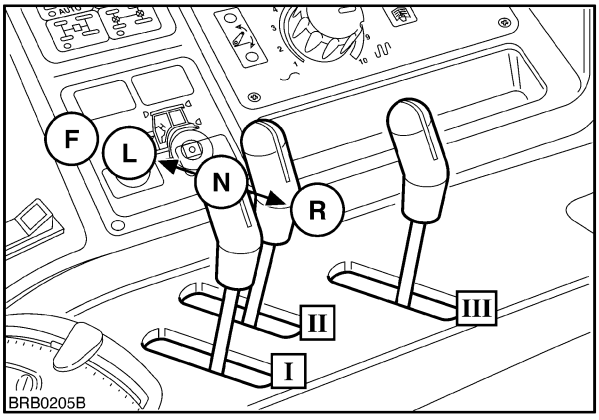
The valves are used to operate external hydraulic cylinders, motors etc. Two or three remote control valves may be installed and are located centrally, at the rear of the tractor.

Availability and function of remote control valves is as follows:

Valve No.	Quantity of valves installed	
	2	3
I	DA/FL/KO	DA/FL
II	DA/SA	DA/SA
III	-	DA/FL/KO

DA/FL/KO = Double-acting, with float and kick-out.
DA/FL = Double-acting with float.
DA/SA = Double-acting, convertible to single-acting.

NOTE: *When all three valves are specified, a flow control valve is provided on remote valve No.* I. *Valves with the kick-out feature will automatically return to the neutral position when the hydraulic cylinder has reached the end of it's stroke.*



71

Figure 71

The valves are operated by levers which are located in the console to the right of the operator's seat.

The levers and their respective valves are colour coded for identification, as follows:

Lever Colour	Valve Position/No.
Green	Right-hand outer - I
Blue	Right-hand inner - II
Brown	Left-hand - III

Figure 72

Each remote control valve lever has three or four operating positions dependent upon specification, as follows:

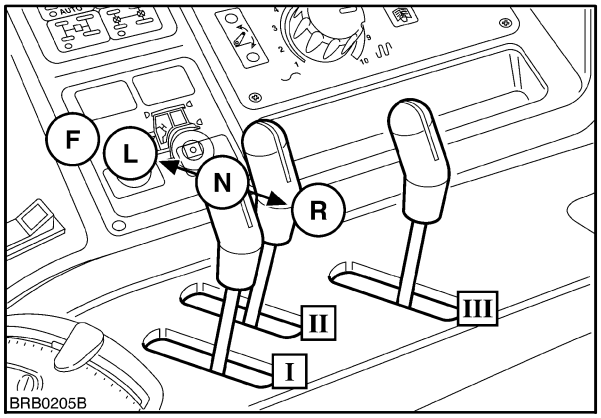
1. Raise (R) – Pull a lever back to extend the cylinder to which it is connected and raise the implement.

2. Neutral (N) – Push the lever forward from the raise position to select neutral and de-activate the connected cylinder.

3. Lower (L) – Push the lever further forward, past neutral, to retract the cylinder and lower the implement.

4. Float (F) (available on valves I and III only) – Push the lever fully forward, beyond the 'lower' position, to select 'float'. This will permit the cylinder to extend or retract freely, thereby allowing equipment such as scraper blades to 'float' or follow the ground contour.

The extend, neutral, retract and float positions are identified by symbols on an adjacent decal.



72

Rear Axle/Hydraulics Oil Level when using Remote Hydraulic Equipment

When checking the rear axle oil level, it is good practice to ensure that the oil is up to the full mark on the dipstick with the tractor parked on level ground. However, when connecting auxiliary equipment to the remote control valves it should be remembered that the equipment utilises oil from the rear axle and could seriously lower the oil level. Operating the tractor with a low oil level may result in damage to the rear axle and transmission components.

NOTE: *Before connecting remote cylinders, stop the engine and thoroughly clean the connections to prevent oil contamination.*

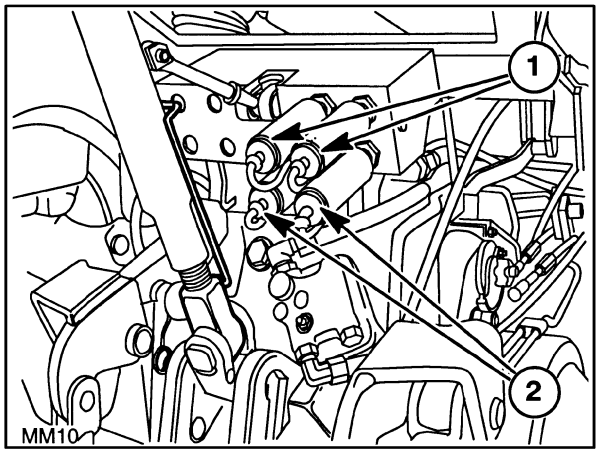
With the rear axle oil level up to the full mark on the dipstick, the following **maximum** oil volumes may be taken from the rear axle to power auxiliary equipment without the need to further top up the system:

Operating stationary equipment on level ground	35 litres (61.6 Imp. pt., 25.6 U.S. qts.)
Operating while driving in normal conditions (flat fields) for short periods only	20 litres (35.2 Imp. pt., 14.6 U.S. qts.)
Operating in other conditions, including longer periods of use	10 litres (17.6 Imp. pt., 7.3 U.S. qts.)

Conversely, the maximum amount of oil that may be added to the rear axle above the normal FULL level is 4 litres (7 Imp. pt., 2.9 U.S. qts.). With this quantity added to the rear axle, the quantities stated above may be increased by the same amount, 4 litres (7 Imp. pt., 2.9 U.S. qts.), but no more.

Connecting Remote Cylinders - Figure 73

Remote control valves are used to operate external hydraulic cylinders, motors, etc., mounted on implements attached to the tractor. Each remote control valve has a pair of $^1/_2$ in. quick-disconnect, female couplers. The couplers are of a self-sealing/locking design but will allow remote cylinder hoses to pull free if the implement should become disconnected from the tractor. The upper coupler (1) of each pair is for feed hoses, the lower couplers (2) are for return hoses.



73

⚠ WARNING ⚠

Hydraulic fluid or diesel oil escaping under pressure can penetrate the skin causing serious injury.

- *Do **not** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.*
- *Stop the engine and relieve pressure before connecting or disconnecting lines by moving the remote control valve lever(s) fully forward to the 'float' position then back to neutral.*
- *Tighten all connections before starting the engine or pressurising lines.*

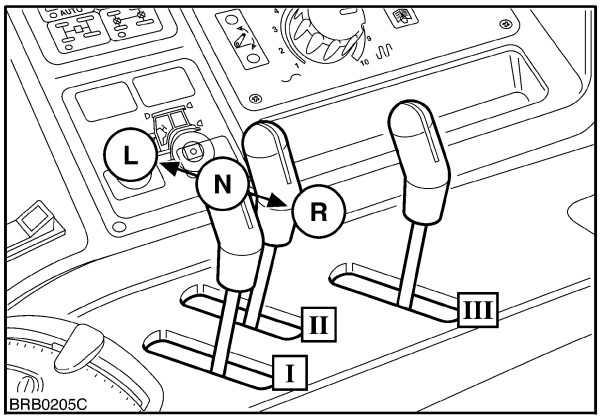
⚠ WARNING ⚠

Never work under or allow anyone near raised equipment as it will drop when relieving pressure in the system or in the event of hose failure, etc. Before disconnecting cylinders or equipment ensure the equipment or implement is supported securely. Always use a secure support for equipment which must be serviced while in the raised position.

To connect a remote cylinder, pull out the rubber plug and insert the feed and/or return hose into the coupler, ensuring that it is correctly seated. Check that there is sufficient slack in the hose(s) to allow the tractor/implement to turn in either direction.

Figure 74

Before disconnecting hoses, equalise the pressure in the hose and tractor couplers. To equalise the pressure, start the engine and move the control lever(s) forward into 'lower', then rearward into 'raise', then return to neutral.



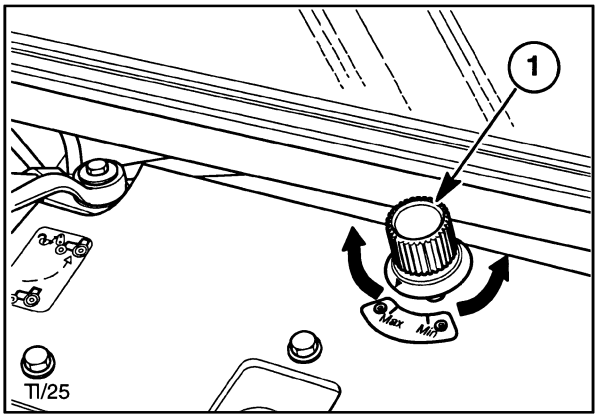
74

To disconnect, grip the hose a short distance from the coupler, push the hose forward, into the coupler, then quickly pull on the hose to 'pop' the coupler free. Clean the rubber plug and insert into the coupler.

NOTE: *Some implements require the use of an additional, remotely mounted control valve. When such a valve is plumbed in to receive an oil supply from the tractor remote valve, it must be of the open centre type.*

Flow Control - Figure 75

If your tractor is equipped with three remote control valves then a flow control valve (1) will be fitted. The flow control valve meters the flow of oil to No. I remote control valve and thus controls the rate of response of a cylinder connected it .



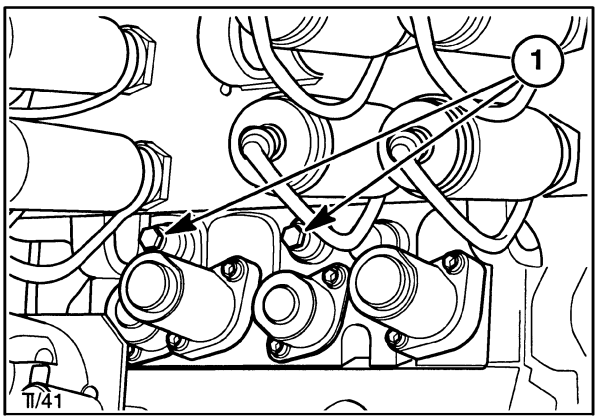
75

Turn the flow control knob anti-clockwise (tortoise symbol) to decrease the rate of oil flow. Turn the knob clockwise (hare symbol) to increase the rate of flow.

NOTE: *Increasing the rate of flow to No. I remote control valve will reduce oil flow to the remaining valves and hydraulic lift.*

Conversion from Double-Acting to Single-Acting - Figure 76

Convertible remote control valves are available that may be changed from double-acting to single-acting operation. Turn the screw (1) beneath each convertible valve, fully in (clockwise) in order to operate double-acting cylinders. Turn fully anti-clockwise (approximately 3 turns) to convert to single-acting operation.

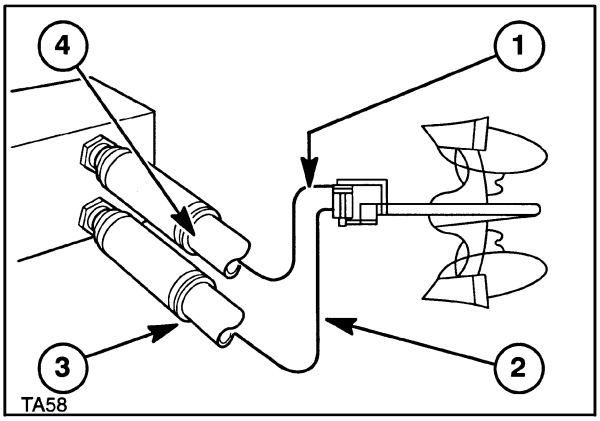


76

Connecting and Operating Double-Acting Cylinders - Figure 77

To operate a double-acting cylinder, connect the pipework to a double-acting remote control valve or a convertible valve in the double-acting mode.

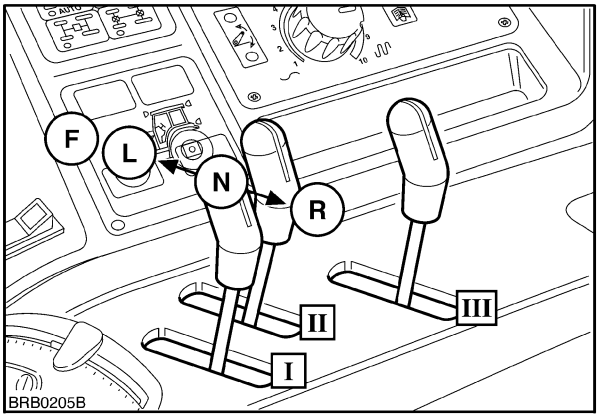
Connect the **feed** hose (1) from a double-acting cylinder to the **upper** coupler (4) on a remote control valve and the **return** hose (2) to the **lower** coupler (3) on the same valve, as previously described.



77

CAUTION

Operating loaders with detented valves (valves with kick-out) may result in uncontrolled movement, resulting in spillage of material from the bucket or objects rolling down the loader arms onto the operator. If required, your New Holland dealer can convert the control valve to operate without the detent feature.



78

Figure 78

To extend a double-acting cylinder, pull the control lever rearwards to the 'raise' position.

To retract a double-acting cylinder, push the control lever forward, past neutral, to the 'lower' position.

Further forward movement of the lever will select 'float' which will allow the cylinder to extend or retract freely. This feature is of material assistance when carrying out work with equipment such as scraper blades and loaders.

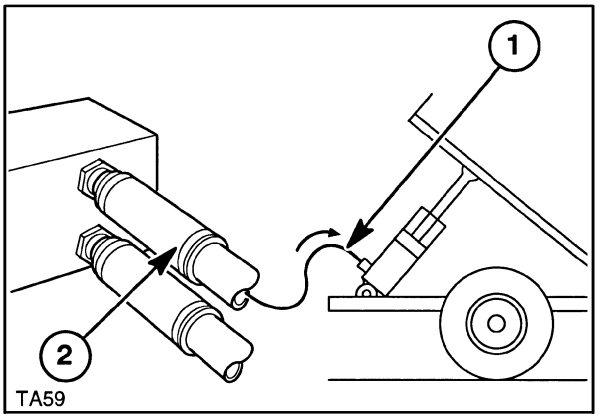
NOTE: *A detent will hold the lever in the selected raise or lower position until the remote cylinder reaches the end of the stroke when the control lever will automatically return to neutral. Alternatively, the lever may be returned to neutral manually. The lever will not return automatically from the float position.*

IMPORTANT: *Do not hold the lever in the raise or lower position once the remote cylinder has reached the end of the stroke as this will cause the relief valve to 'blow'. Forcing oil through the relief valve for extended periods will overheat the oil and may lead to failure of hydraulic and driveline components.*

Connecting and Operating Single-Acting Cylinders - Figure 79

To operate a single-acting cylinder, connect the pipework to a single-acting remote control valve or a convertible valve in the single-acting mode.

Connect the hose (1) from a single-acting cylinder to the **upper** coupler (2) on a remote control valve, as previously described.



79

Figure 80

To extend a single-acting cylinder, pull the control lever rearward to the 'raise' position.

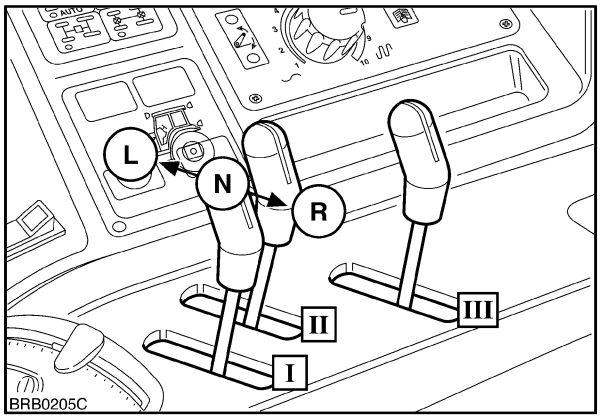
Manually return the lever to the neutral position to stop the cylinder before it is fully extended or, if the remote control valve has the kick-out feature, allow the valve to return to neutral automatically when the cylinder reaches the end of its stroke.

NOTE: *When in the single-acting mode, a control lever will only return to neutral automatically at the end of the lift stroke.*

To retract a single-acting cylinder move the lever forward, past neutral, to the 'lower' position.

IMPORTANT: *Do not hold the lever in the raise or lower position once the remote cylinder has reached the end of the stroke as this will cause the relief valve to 'blow'. Forcing oil through the relief valve for extended periods will overheat the oil and may lead to failure of hydraulic and driveline components.*

IMPORTANT: *A single-acting cylinder may also be operated from a double-acting remote control valve. However, it is important to note that the 'float' position must be used to retract the cylinder. To select 'float', move the lever further away from you, past the 'lower' position.*



80

Operating Continuous Flow Hydraulic Equipment - Figure 81

To operate continuous flow hydraulic equipment, connect the pipework to a double-acting remote control valve or a convertible valve in the double- acting mode.

Figure 81

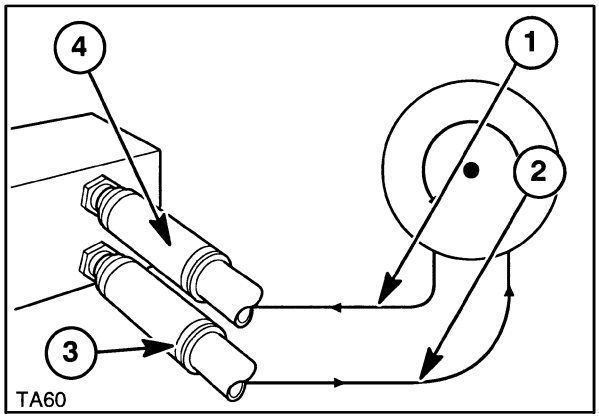
Continuous flow hydraulic equipment (e.g. hydraulic motors) should be connected to the remote control valve couplers with the **feed** hose (2) connected to the **lower** coupler (3) and the **return** hose (1) connected to the **upper** coupler (4) of the same valve.

Use the 'lower' position to operate a hydraulic motor.

IMPORTANT: *To stop the motor, move the lever forward from the 'lower' position to the 'float' position. The motor will then slow to a halt and not stop abruptly causing internal line pressures which, unless relieved by special valving, could damage the motor seals. Never select the neutral or raise positions when the motor is operating*

Observe the following to further protect the tractor and equipment:

- Do not open any by-pass valve in the equipment or motor. Use the flow control valve to control the rate of flow or speed of the motor.
- Do not hold the remote control valve lever to operate the equipment. If the detent will not hold the lever in the lower position, check the equipment for proper adjustment or contact your dealer for assistance in adapting the equipment to suit the tractor.
- To assure optimum hydraulic oil cooling and prevent overheating, operate continuous flow equipment at the highest flow setting (by use of the flow control valve) and lowest engine speed that will give the required machine performance and speed.
- It is recommended that a temperature gauge, where available, is installed in the remote circuit when using hydraulic motors for continuous operation. If over-heating occurs, stop the hydraulic motor until the oil cools. Ensure the flow control setting is at maximum and the engine speed at a minimum, appropriate to machine performance. If operating conditions are normal and high temperatures persist, install an oil cooler in the motor return circuit. The maximum recommended operating temperature of the oil is 110°C (230°F).



81

Operating Two Remote Valves Simultaneously or a Valve and the Hydraulic Lift Simultaneously

If operating two remote control valves simultaneously or a remote valve and the hydraulic lift, the flow control valve should be adjusted to provide a partial flow. If not so adjusted, all the available flow may be directed to the full flow circuit when the pressure in that circuit is less than that of the other circuits in use.

If your tractor does not have the flow control feature, then the remote control valves will take priority over the hydraulic lift.

Bleeding Remote Cylinders

When connecting a cylinder with trapped air, i.e., a new cylinder, one that has been out of service or one that has had the hoses disconnected, it will be necessary to bleed the cylinder to remove the air.

With the hoses connected to the remote control valve couplers at the rear of the tractor, position the cylinder with the hose end uppermost and extend and retract the cylinder seven or eight times using the remote control valve operating lever.

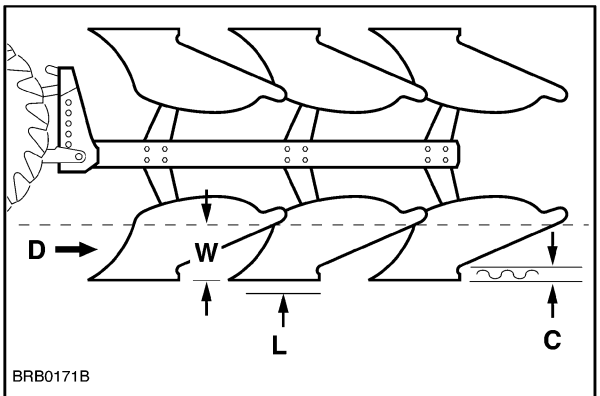
Check the rear axle oil level before and after operating a remote cylinder.

ELECTROLINK™ DRAFT CONTROL (where fitted)

This system described here is known as Electrolink Draft Control. This electronically controlled hydraulic system senses changes in the draft loading via sensors in the lower link pins of the 3-point linkage and changes in the position of the linkage via a sensor on the cross shaft. The system functions in Position Control or Draft Control.

Position Control provides accurate control of implements, such as sprayers, rakes, mowers, etc., that operate above the ground. Once implement height has been set, the system will maintain the selected position irrespective of any external forces acting upon it.

Draft Control is designed for mounted or semi-mounted implements operating in the ground. Changes in soil resistance cause the draft loading on the implement to increase or decrease.



D = Draft load on implement
W = Working depth (set by draft loading wheel)
L = Lower limit (set by position lever)
C = Correction movement (set by sensitivity control)

82

Draft Control Operational Notes - Figure 82

Draft control sets the working depth in the soil by maintaining a constant draft load. If the position control lever is set just below the normal Draft Control working depth, it will prevent the implement from 'diving' or working too deep if an area of soft or light soil is encountered.

Position control will override draft control when the position control lever is moved above the working depth set by the draft control wheel. Therefore, the position control lever can be used to lift the implement out of the ground, from the normal draft control working depth, without changing the draft control setting.

This function can be useful when a gradual lift out is required. The thumbwheel stop can be set so that the position control lever can be returned quickly to a lower limit position just below the normal draft control working depth.

The raise/lower switch would normally be used to raise or lower an implement during a work cycle.

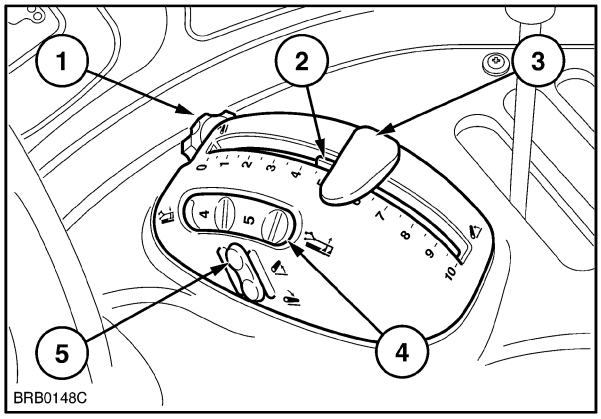
Control Pod - Figure 83

The **thumbwheel** (1), when rotated, will move the **adjustable stop** (2).

The **position control lever** (3), is used to set implement height, when operating in Position Control. Use it to set the maximum implement depth when operating in Draft Control.

The **draft loading wheel** (4), determines draft load, and therefore implement working depth, by setting a force on the draft sensing pins. Selecting position 10 will provide maximum load and therefore maximum implement depth.

The **raise/lower switch** (5), is a three position switch that enables the operator to rapidly raise the implement to the position set by the height limit control and to lower the implement back down to the working depth/height set by the position or draft controls, without disturbing the settings. The switch also provides for faster ground engagement, if required. For further information, see text on page 3-53.



83

EDC Panel - Figure 84

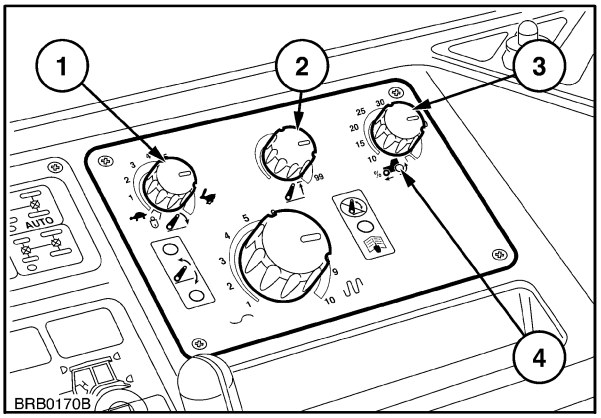
The **drop rate control knob** (1), controls the speed at which the lower links and implement drop during a lowering cycle.

The **height limit control knob** (2), limits the height to which the linkage may be raised. Adjust this knob to avoid the possibility of a large implement damaging the tractor when fully raised.

The **slip limit control knob** (3), available only with the optional radar sensor unit, enables the operator to select a wheel slip threshold, above which the implement will raise until wheel slip returns to the set level.

The **slip limit 'on' indicator** (4), will illuminate when slip control is activated.

The **draft sensitivity knob** (2) Figure 85, is used to make the system more sensitive or less sensitive to changes in the draft loading. Maximum draft sensitivity is denoted by the figure 10.



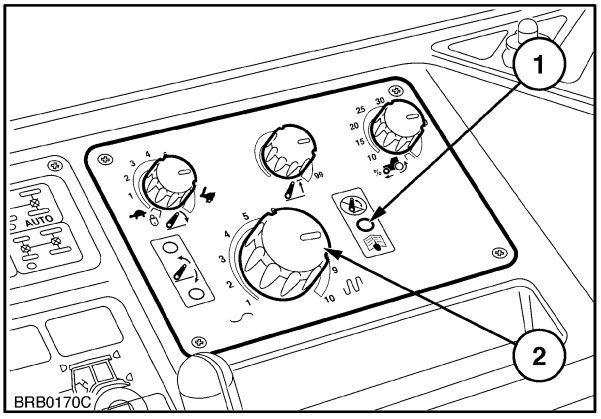
84

EDC Panel - Figure 85

The **malfunction warning light** (1), serves two purposes:

- **Flashing light** means that there is a malfunction in the system circuits. This is repeated on the analogue/ digital instrument panel as a warning light.

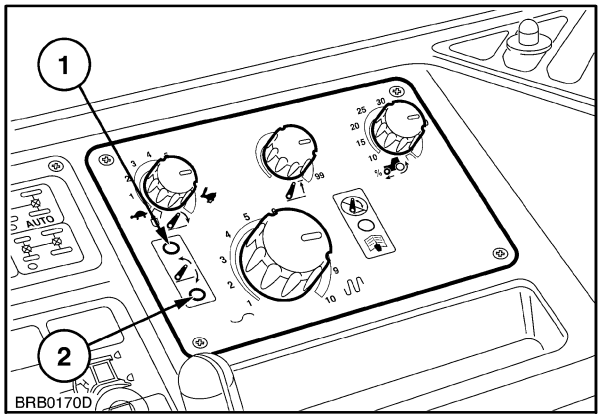
- **Steady light** signifies 'hitch disabled'. Again, the 'hitch disabled' warning is repeated on the instrument panel as a warning light or as an LCD symbol. See Figures 89, 90 and related text.



85

EDC Panel - Figure 86

The **indicator lights** (1) and (2) operate when the position control lever is used to raise or lower the implement or as lift and lower corrections occur during normal tractor operation. The lower light (2) will illuminate when the 3-point linkage lowers. The upper light (1) will illuminate when the linkage raises.

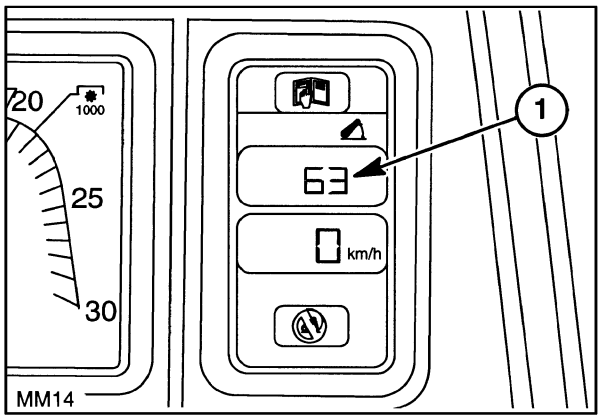


86

Instrument Displays - Figure 87 or 88

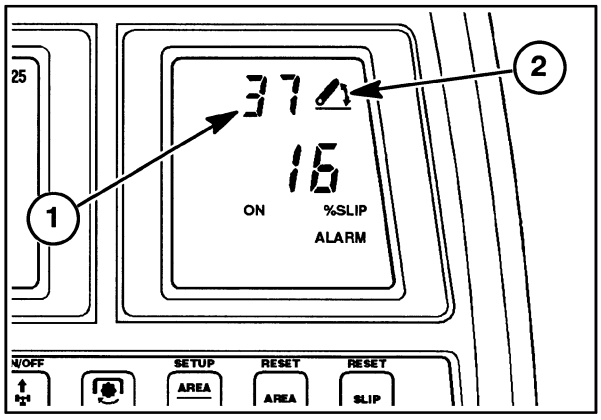
When operating in Position Control, the digital display on the instrument panel (1) Figure 87 or 88, indicates the position of the lower links over a scale of '0' to '99'. A display of '0' indicates that the links are fully lowered. '99' indicates they are fully raised.

When operating in Draft Control, the display will show 'dr'.



87

If your tractor is equipped with an electronic instrument panel, then the 'hitch enabled' symbol (2) Figure 88, will display when the 3-point linkage is in phase with the position control.



88

Instrument Displays - Figure 89, 90 or 91

In the event of the 3-point linkage/position control becoming out of phase with one another, this display will disappear to be replaced by the 'hitch disabled' symbol. See below.

The malfunction light on the EDC panel (Figure 85) is repeated on the instrument panel, as follows:

A **flashing malfunction warning light** on the EDC panel is repeated on the analogue/digital instrument panel (1) Figure 89 and signifies a malfunction in the system. See also page 2-33.

On the electronic instrument panel, system malfunction is denoted by an LCD symbol (1) Figure 90. See also page 2-53.

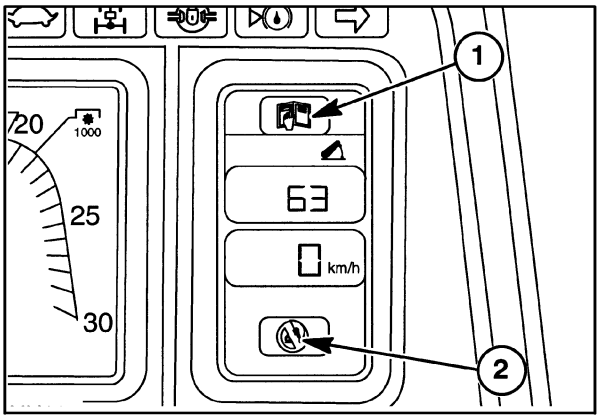
A **steady malfunction warning light** on the EDC panel signifies 'hitch disabled' and is repeated on the instrument panel as a warning light (2) Figure 89 or as an LCD symbol (2) Figure 90.

The **'hitch disabled' warning light/LCD symbol** signifies that the position control setting does not correspond to the position of the lower links with the result that the lower links cannot be raised or lowered using the in-cab controls. The 'hitch disabled' warning will display if:

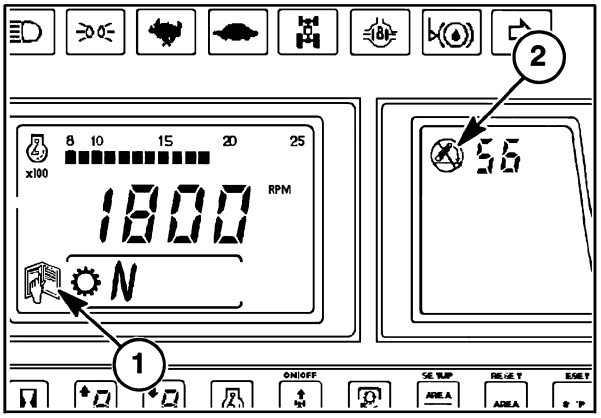
- The position control lever has been moved with the engine stopped.

- One of the external power lift switches has been operated to raise or lower the three-point linkage. See 'External Hydraulic Power Lift Controls' on page 3-55.

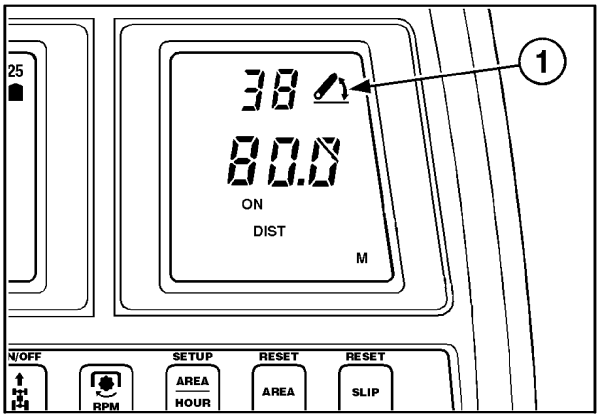
To put the position control back into phase with the lower links, with the raise/lower switch in the central position and the engine running, move the position control lever slowly forward or rearward, as required, until the position of the lever matches the linkage height. The 'hitch disabled' warning light will go out or, if your tractor is equipped with an electronic instrument panel, the 'hitch disabled' LCD symbol will disappear to be replaced by the 'hitch enabled' symbol (1) Figure 91. The 3-point linkage will now raise or lower normally.



89



90



91

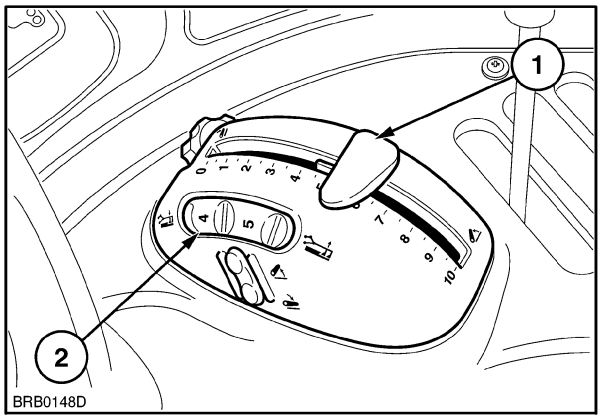
PRE-OPERATION SETTINGS

Attach the implement to be used to the 3-point linkage.

Figure 92

Turn the **draft loading wheel** (2) fully forward to position 10 - this is the Position Control setting.

Start the engine and, using the **position control lever** (1), raise the implement in stages, ensuring that there is at least 100 mm (4 in.) clearance between the implement and any part of the tractor. Note the digital display reading on the instrument panel. If the reading is less than '99' it means that the implement is not fully raised.



92

Figure 93

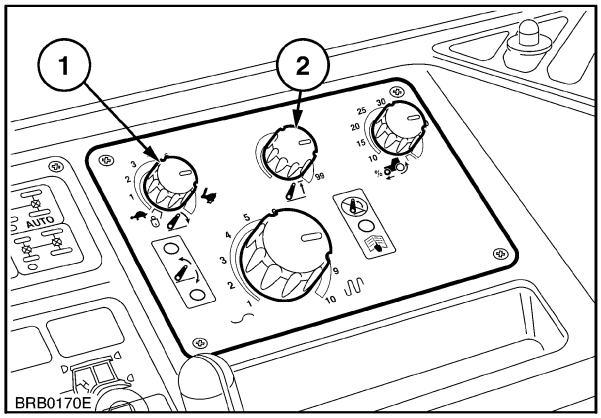
Adjust the **height limit control knob** (2) to prevent the linkage being raised further and so avoid the possibility of the implement damaging the tractor when fully raised.

When the raise/lower switch or the position control lever is used to raise the implement, it will only raise to the height set by the height limit control, as determined in the previous step.

Adjust the rate of drop, to suit the size and weight of the attached implement, by rotating the **drop rate control knob** (1). Turn the knob clockwise to speed up the drop rate or anti-clockwise to slow down the drop rate.

IMPORTANT: *When first setting the implement up for work, keep the drop rate control knob in the slow drop position ('tortoise' symbol).*

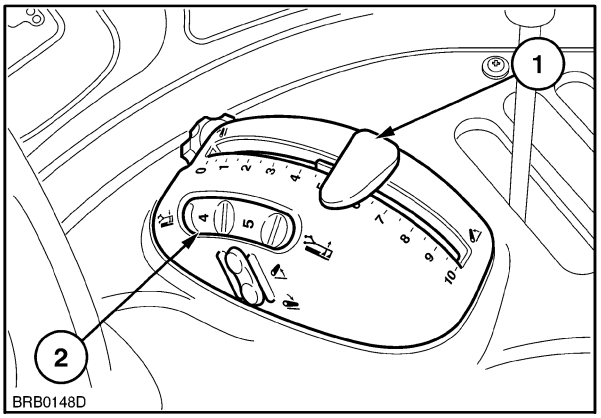
When the raise/lower switch is used to lower the implement, it will lower at a controlled rate as determined in the previous step.



93

DRAFT CONTROL OPERATION

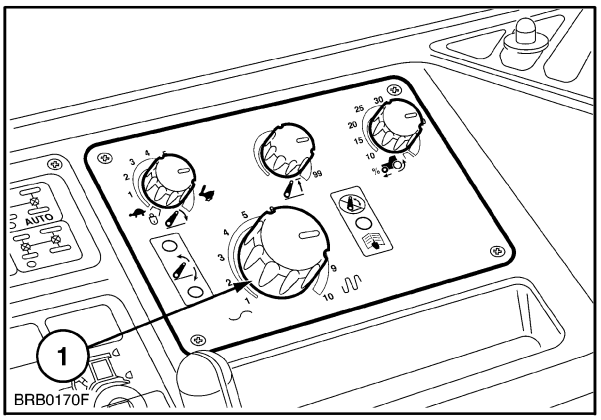
To operate in Draft Control adjustment of several controls is necessary to suit the implement and field conditions.



94

Figure 94

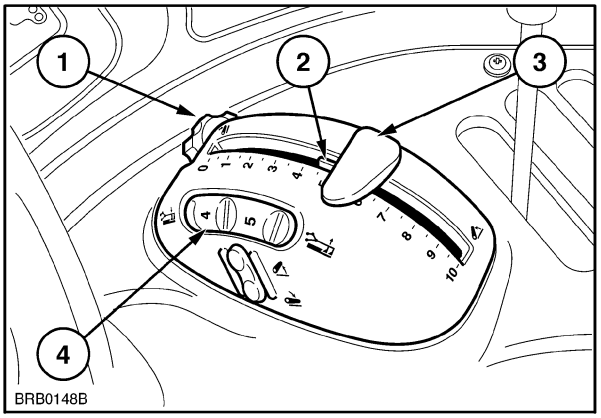
The **draft loading wheel** (2) determines implement depth by setting a required force on the draft sensing pins Set the wheel to the mid-position (position 5) prior to commencing work.



95

Figure 95

The position of the **draft sensitivity knob** (1), determines the sensitivity of the system. Set the knob to the mid-position before entering the field.



96

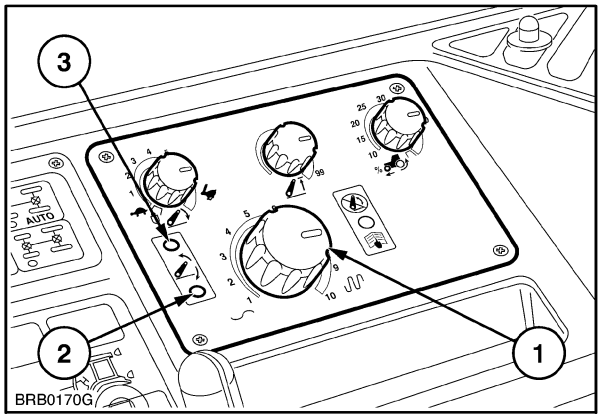
Figure 96

Drive the tractor into the field and lower the implement into work by moving the **position control lever** (3), forward. Use the position control lever to set the maximum depth and so prevent ‘diving’ when areas of light soil are encountered. Set the required implement working depth by rotating the **draft loading wheel** (4).

Rotate the **thumbwheel** (1) to move the **adjustable stop** (2) against the position control lever so that the selected setting may be quickly found.

Figure 97

Observe the implement as it pulls through the soil and adjust the **draft sensitivity knob** (1), until the tendency to raise or lower, due to variations in soil resistance, is satisfactory. Once set, the tractor hydraulic system will automatically adjust implement depth to maintain an even pull (draft load) on the tractor.



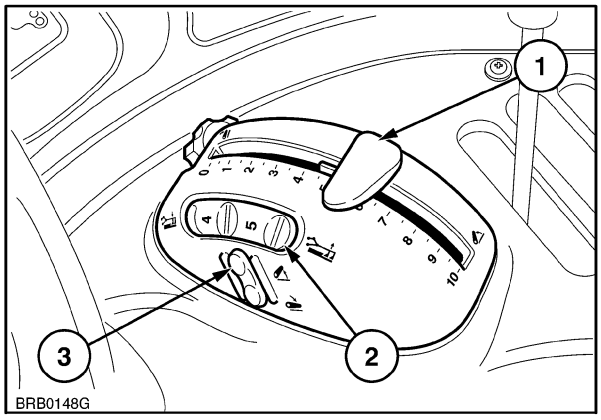
97

The optimum setting will be achieved by observing the **movement indicator lights** (2) and (3). The upper light (3) will illuminate every time the system raises the implement as normal draft corrections occur. The lower light (2) will illuminate as the implement lowers.

Turn the **draft sensitivity knob** (1) slowly clockwise. The system will respond with smaller, quicker movements as will be seen by **both** the indicator lights flickering. At this point, turn the knob slightly anti-clockwise until either of the indicator lights flashes once every 2 or 3 seconds or, as required, to suit the soil conditions.

Figure 98

Once the required working conditions have been established there is no need to move the position control lever again until the work in hand is completed.



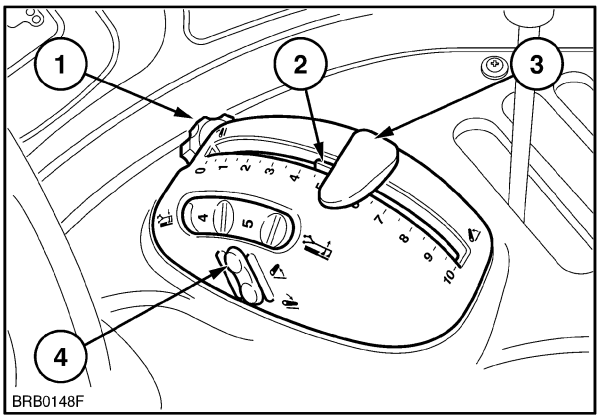
98

Upon reaching the headland, press the top of the **raise/lower switch** (3) to quickly lift the implement to the position set by the height limit control knob. When re-entering the working area, move the switch to the central position and the implement will lower at the rate set by the drop rate control knob and stop when it reaches the depth set by the **draft loading wheel** (2).

Figure 99

Faster implement penetration may be required, for example, after turning at a narrow headland. Also, some implements are reluctant to penetrate, particularly if the ground is heavy. Press and hold the bottom of the **raise/lower switch** (4) and the implement will lower at the rate set by the drop rate control knob, until it contacts the ground. The drop rate and the position control settings will then be overridden and the implement will quickly penetrate the ground, rising to the preset working depth when the switch is released.

Alternatively, the adjustable stop may be used to set the implement depth. When the required implement depth has been established, rotate the **thumbwheel** (1). This will move the **stop** (2) so that it is against the front edge of the **position control lever** (3). Whenever the implement is raised, using the position control lever, it will always return to the same working depth when the lever is moved forward to contact the stop.



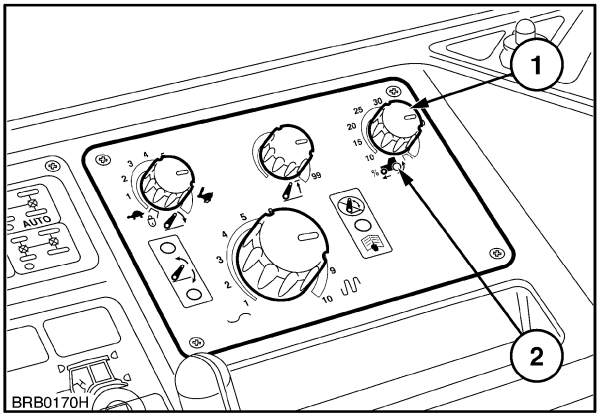
99

NOTE: *If required, the position control may be eased sideways (to the left), in order to bypass the stop, to lower the implement further.*

Figure 100

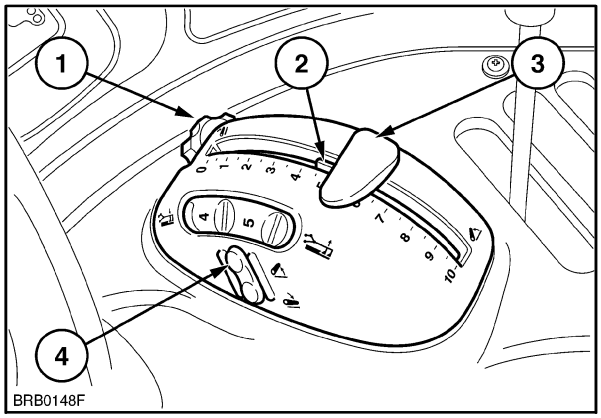
The **slip limit control knob** (1), available only with the optional radar sensor unit, enables the operator to select a wheel slip threshold, above which the implement will raise until wheel slip returns to the preset level. The system overrides the normal draft and position control sensing signals of the hydraulics so care must be taken not to select too low or too high a slip limit. Setting the slip limit to a very low level, unobtainable in wet conditions, may have a detrimental effect on the work rate/depth.

The **slip limit 'on' indicator** (2) will illuminate when slip control is activated and the implement is raising to restore the selected slip rate. The knob is detented at the 'off' position (knob fully clockwise).



100

POSITION CONTROL OPERATION



101

Figure 101

To operate in Position Control, the **draft loading wheel** (2) should, ideally, be rotated fully forward to position 10.

Use the **position control lever** (3) to raise and lower the 3-point linkage. The implement will raise and stop at the height set by the **height limit control knob.**

NOTE: *The rate of lift will be adjusted automatically. If a large movement of the position control lever is made then the lower links will respond by moving rapidly. As the links approach the position set by the position control lever, implement movement will be slower.*

When the implement is at the required working height, use **thumbwheel** (1) to set the **adjustable stop** (2) against the **position control lever** (3). Every time the position control lever is moved, it may be quickly returned to it's original position, against the stop, to maintain the required implement height.

If it is required to raise the implement at the headland, press the top of the **raise/lower switch** (4), to lift the implement to the position set by the height limit control knob. When re-entering the work area, set the switch to the central position and the implement will lower to the height originally set by the **position control lever** (3).

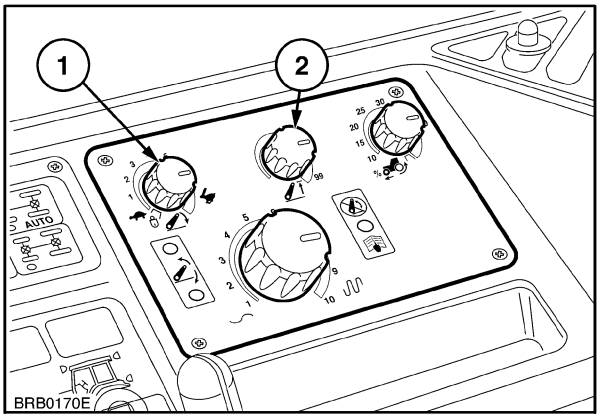
⚠ CAUTION ⚠

When transporting equipment on the three-point linkage, raise the implement using the raise/lower switch (4) and select transport lock (see following text). This will prevent accidental lowering of the 3-point linkage which could result in attached equipment becoming damaged, damaging the road surface or causing personal injury.

TRANSPORT LOCK AND DYNAMIC RIDE CONTROL

Transport Lock - Figure 102

When transporting equipment on the 3-point linkage, turn the **drop rate control knob** (1), fully anti-clockwise to the transport lock position (padlock symbol). This will prevent the implement from accidentally lowering and damaging the road surface.



102

Dynamic Ride Control - Figure 102

When transporting equipment on the 3-point linkage, implement bounce can lead to lack of steering control at transport speeds. With Dynamic Ride Control selected, when the front wheels hit a bump, causing the front of the tractor to rise, the hydraulic system will immediately react to counter the movement and minimise implement bounce to provide a smoother ride.

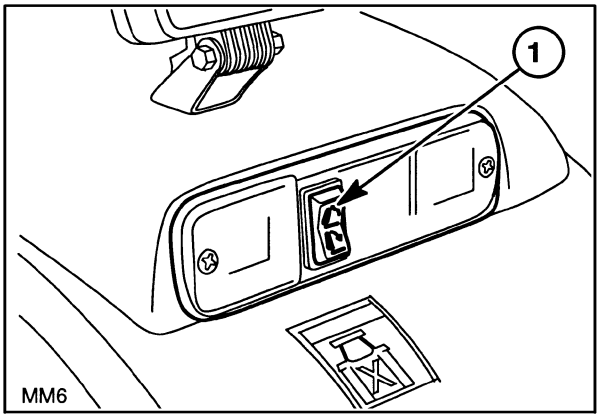
To engage Dynamic Ride Control, turn the **drop rate control knob** (1), fully anti-clockwise to the transport lock position. Press the top of the raise/lower switch to raise the implement to the height set by the **height limit control** (2).

Dynamic Ride Control will only operate at speeds above 8 kph (5 MPH). When tractor speed exceeds 8 kph (5 MPH), the implement will drop by 4 - 5 points (as displayed on the instrument panel) as the hydraulic system makes corrections to counteract implement bounce. Corrections are denoted by the movement indicator lights flashing. When tractor speed falls below 8 kph (5 MPH) the implement will raise again to the height set by the height limit control and Dynamic Ride Control will become inoperative.

EXTERNAL HYDRAULIC POWER LIFT CONTROLS

Figure 103

To aid attachment of implements, external power lift controls are provided. A **rocker switch** (1), is provided on each rear light assembly. The switches are of a three-position design, spring-loaded to return to the central position (off).



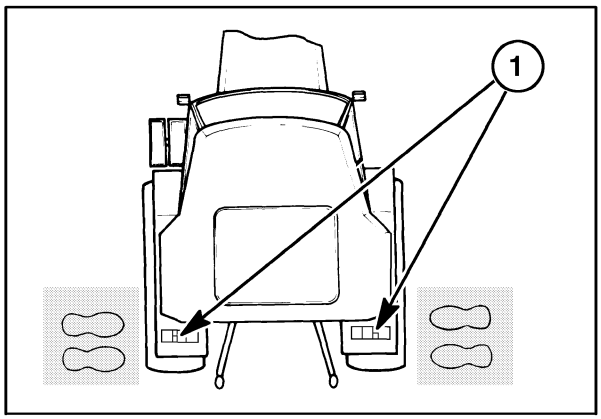
103

CAUTION

Before leaving the tractor to operate the external switches:

- *Move the gearshift levers to neutral.*
- *Disengage the P.T.O.*
- *Apply the parking brake.*

With the engine running, move the hand throttle lever to the low idle position (fully rearwards).



104

Figure 104
The operator must only activate the external switches (1) while standing to the side of the tractor (outboard of the rear tyres). To avoid damage to implement or tractor, operation of the in cab and external hydraulic controls should **not** be carried out simultaneously.

WARNING

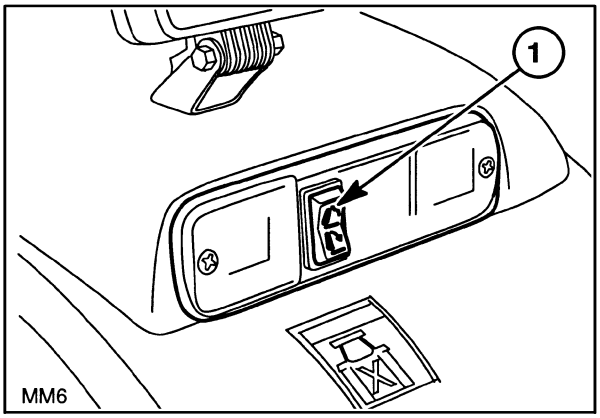
Before using the external hydraulic power lift switches, ensure that no person or object is in the area of the implement or 3-point linkage.

Never operate the external switches while standing:

- *Directly behind the tractor or tyres.*
- *Between the lower links.*
- *On or near the implement.*
- *Never extend arms, legs, any part of the body or any object into the area near the 3-point linkage or implement while operating the external switch.*
- *Never have an assistant working the opposite set of controls.*
- *When moving to the opposite set of controls, move around the tractor or implement.*
- *Do not cross between the implement and tractor.*

Figure 105

Pressing the upper part of the rocker switch (1), will cause the lift linkage to raise slowly. Pressing the lower part will cause the linkage to lower.

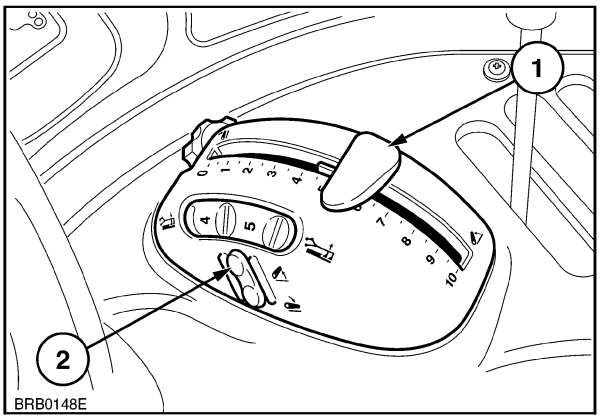


105

Figure 106

To put the position control back into phase with the lower links, with the **raise/lower switch** (2) in the central position and the engine running, move the **position control lever** (1) slowly forward or rearward, as required, until the position of the lever matches the linkage height. The 'hitch disabled' warning light will go out or, if your tractor is equipped with an electronic instrument panel, the 'hitch enabled' symbol will appear. The 3-point linkage will now raise or lower normally.

IMPORTANT: *When control of the 3-point linkage is transferred back to the in-cab position control, an attached implement may raise fully, if the height limit control has not been set, and damage the rear of the cab. Operator's should be aware of this and take appropriate action to stop raising before full lift height is reached. Adjust the height limit control knob as described under* 'Pre-Operation Settings' *on page 3-50.*



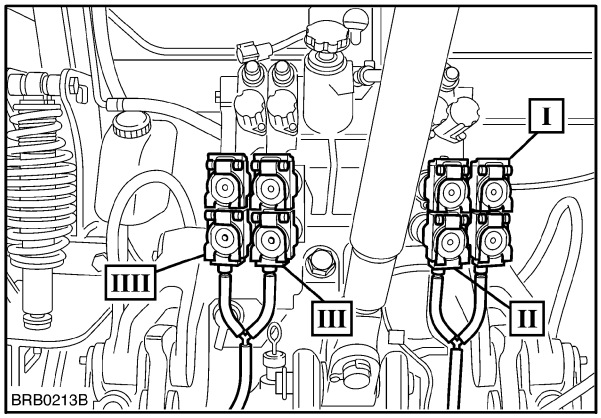
106

REMOTE CONTROL VALVES - CLOSED CENTRE LOAD-SENSING TYPE (where fitted)

Description - Figure 107

The remote control valves described here are of the closed centre, load-sensing type.

The valves are used to operate external hydraulic cylinders, motors etc. Up to four remote control valves may be installed and are located at the rear of the tractor. Valves I and II are installed to the right of the hydraulic top link, valves III and IIII to the left. All remote valves incorporate an automatic lock valve in the lower (raise) port to prevent inadvertent leak down of the implement.

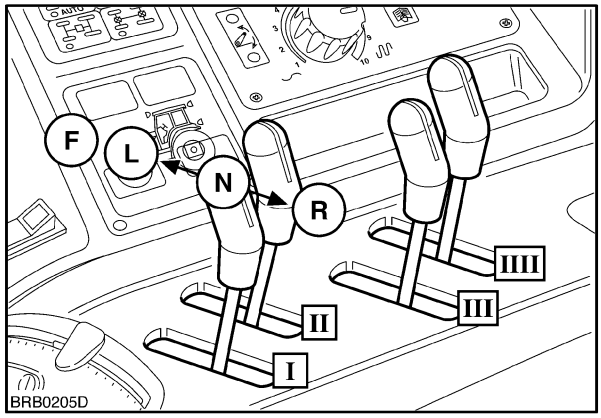


107

Figure 108

The valves are operated by levers which are located in the console to the right of the operator's seat. The levers and their respective valves are colour coded for identification, as follows:

Lever Colour	Valve Position/No.
Green	Right-hand outer - I
Blue	Right-hand inner - II
Brown	Left-hand inner - III
Black	Left-hand outer- IIII



108

Each remote control valve lever has four operating positions, as follows:

1. Raise (R) - Pull a lever rearward to extend the cylinder to which it is connected and raise the implement.

2. Neutral (N) - Push the lever forward from the raise position to select neutral and de-activate the connected cylinder.

3. Lower (L) - Push the lever further forward, past neutral, to retract the cylinder and lower the implement.

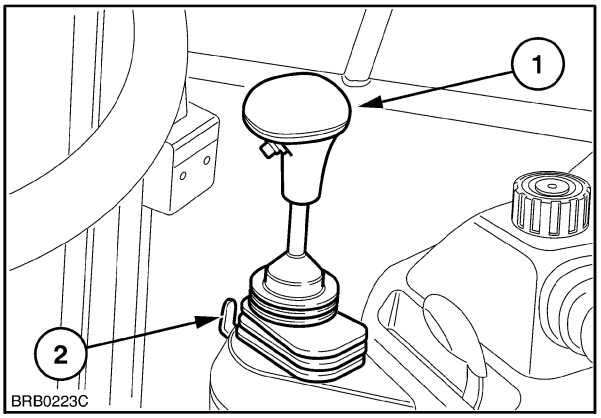
4. Float (F) - Push the lever fully forward, beyond the 'lower' position, to select 'float'. This will permit the cylinder to extend or retract freely, thereby allowing equipment such as scraper blades to 'float' or follow the ground contour.

The extend, neutral, retract and float positions are identified by symbols on a decal adjacent to the control levers.

Figure 109

When four remote control valves are specified, an alternative joystick control (1) may be fitted to operate remote control valves III and IIII. The joystick, located at the front of the right-hand console, operates in a cross pattern.

The push/pull lever (2) is used to lock the joystick in the neutral position and avoid accidental actuation of a cylinder. Push the lever in to lock the joystick in neutral. Pull the lever out when it is required to operate equipment connected to the remote control valves.



109

Figure 110

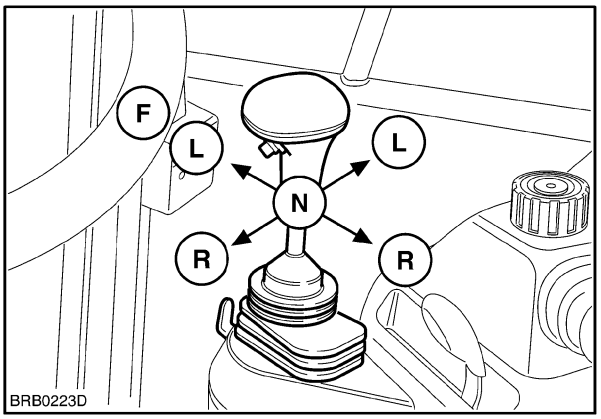
As with the conventional levers, the joystick provides four positions: Raise (R), Neutral (N), Lower (L) and, on No. III valve only, Float (F).

Forward and reverse movements of the joystick will operate valve No. III in the same way as a conventional remote valve lever.

When the joystick is moved to the left or right it will activate valve No. IIII. There is no float position on remote valve No. IIII.

The joystick has the added advantage of being able to operate two remote control valves simultaneously by moving the lever diagonally.

NOTE: *The float position is also used for retracting a single-acting hydraulic ram. (see* 'Operating Single-Acting Cylinders' *on page 3-43).*



110

Rear Axle/Hydraulics Oil Level when using Remote Hydraulic Equipment

When checking the rear axle oil level, it is good practice to ensure that the oil is up to the full mark on the dipstick with the tractor parked on level ground. However, when connecting auxiliary equipment to the remote control valves it should be remembered that the equipment utilises oil from the rear axle and could seriously lower the oil level. Operating the tractor with a low oil level may result in damage to the rear axle and transmission components.

NOTE: *Before connecting remote cylinders, stop the engine and thoroughly clean the connections to prevent oil contamination.*

With the rear axle oil level up to the full mark on the dipstick, the following **maximum** oil volumes may be taken from the rear axle to power auxiliary equipment without the need to further top up the system:

Operating stationary equipment on level ground	35 litres 61.6 Imp. pt. 25.6 U.S. qts.
Operating while driving in normal conditions (flat fields) for short periods only	20 litres 35.2 Imp. pt. 14.6 U.S. qts.
Operating in other conditions, including longer periods of use	10 litres 17.6 Imp. pt. 7.3 U.S. qts.

Conversely, the maximum amount of oil that may be added to the rear axle above the normal FULL level is 4 litres (7 Imp. pt., 2.9 U.S. qts.). With this quantity added to the rear axle, the quantities stated above may be increased by the same amount, 4 litres (7 Imp. pt., 2.9 U.S. qts.), but no more.

WARNING

Hydraulic fluid or diesel oil escaping under pressure can penetrate the skin causing serious injury.

- *Do **not** use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks.*
- *Stop the engine and relieve pressure before connecting or disconnecting lines by moving the remote control valve lever(s) fully forward to the 'float' position then back to neutral.*
- *Tighten all connections before starting the engine or pressurising lines.*

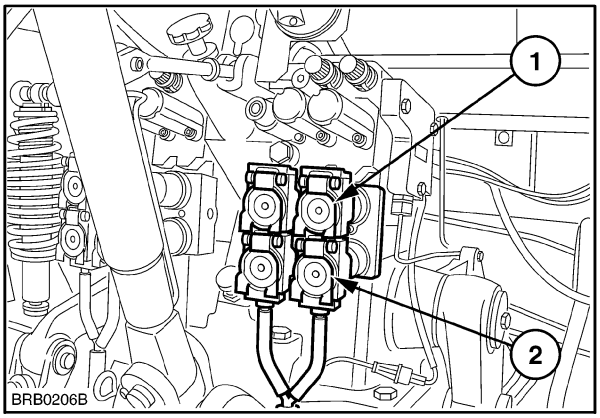
If any fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

WARNING

Never work under or allow anyone near raised equipment as it will drop when relieving pressure in the system or in the event of hose failure, etc. Before disconnecting cylinders or equipment ensure the equipment or implement is supported securely. Always use a secure support for equipment which must be serviced while in the raised position.

Connecting Remote Cylinders - Figure 111

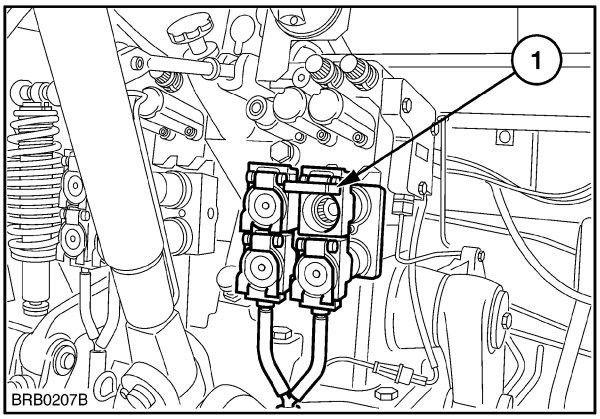
Each remote control valve has a pair of $^1/_2$ in. quick-disconnect, female couplers (1) and (2). The couplers are of a self-sealing/locking design but will allow remote cylinder hoses to pull free if the implement should become disconnected from the tractor. The lower coupler (2) of each pair is for the feed hose, the upper coupler (1) is for the return hose. The couplers referred to in this picture are for remote control valve No. I.



111

Figure 112

Hinged, spring-loaded dust caps are provided on each coupler. To connect a remote cylinder, lift the dust cap (1) and insert the feed and/or return hose into the coupler, ensuring that it is correctly seated. Ensure that there is sufficient slack in the hose(s) to allow the tractor/implement to turn in either direction. To disconnect, grip the hose a short distance from the coupler, push the hose forward, into the coupler, then quickly pull on the hose to 'pop' the coupler free.



112

Operating Notes

A detent will hold the lever in the selected extend or retract position until the remote cylinder reaches the end of the stroke when the control lever will automatically return to neutral. Alternatively, the lever may be returned to neutral manually. The lever will not return automatically from the float position.

NOTE: *Do not hold the lever in the extend or retract position once the remote cylinder has reached the end of the stroke as this will cause the system to operate at maximum pressure. Over an extended period, this could overheat the oil and may lead to failure of hydraulic and driveline components.*

WARNING

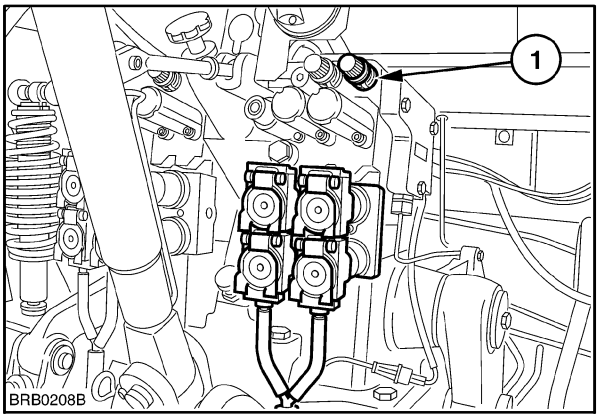
Operating loaders with detented valves may result in uncontrolled movement, resulting in spillage of material from the bucket or objects rolling down the loader arms onto the operator. If required, your New Holland dealer can convert the control valve to operate without the detent feature.

Figure 113

Each remote control valve has its own flow control valve (1) which permits individual flow control when operating two or more valves simultaneously.

Turn the flow control knob anti-clockwise to increase the rate of oil flow.

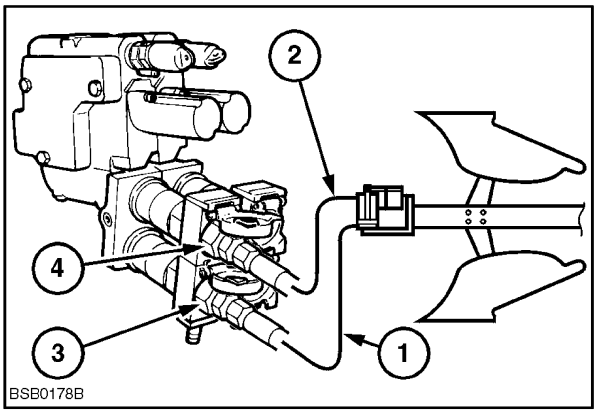
Turn the knob clockwise to decrease the rate of flow. For flow rates, see Section 8 - Specifications.



113

Connecting and Operating Double-Acting Cylinders - Figure 114

Connect the **feed** hose (1) from a double-acting cylinder to the **lower** coupler (3) on the remote control valve. Connect the **return** hose (2) to the **upper** coupler (4) on the same valve.



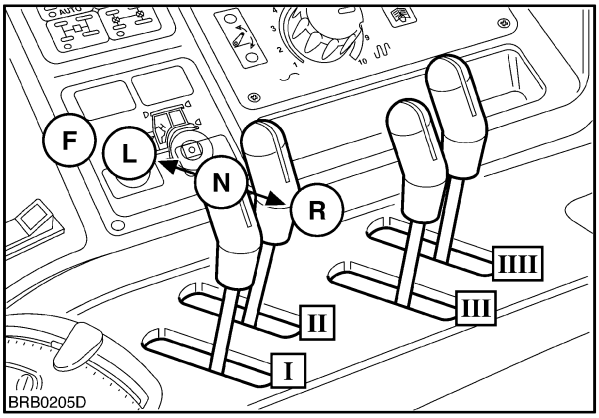
114

Figure 115

To extend a double-acting cylinder, pull the control lever Figure 115 rearwards, to the 'raise' position.

To retract a double-acting cylinder, push the control lever forward, past neutral to the 'lower' position.

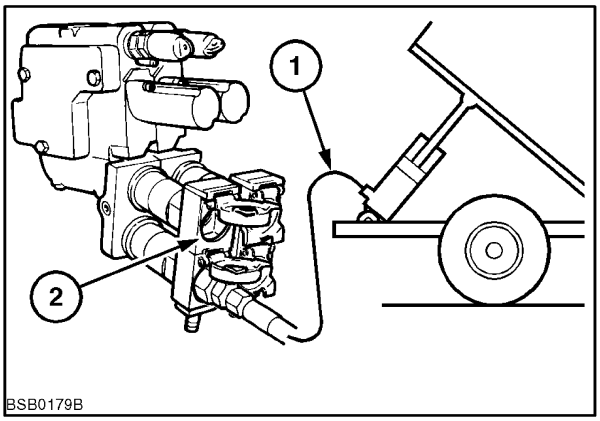
Further forward movement of the lever will select 'float' which will allow the cylinder to extend or retract freely. This feature is of material assistance when carrying out work with equipment such as scraper blades and loaders.



115

Connecting and Operating Single-Acting Cylinders - Figure 116

Connect the hose (1) from a single-acting cylinder to the **lower** coupler (2) on the remote control valve, as previously described.



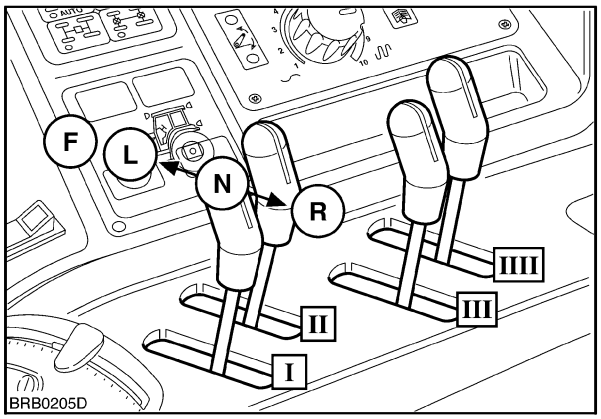
116

Figure 117

To extend a single-acting cylinder, pull the control lever rearwards, to the 'raise' position.

Manually return the lever to the neutral position to stop the cylinder before it is fully extended or allow the valve to return to the neutral automatically when the cylinder reaches the end of it's stroke.

To retract a single-acting cylinder, move the lever fully forward, to the 'float' position.

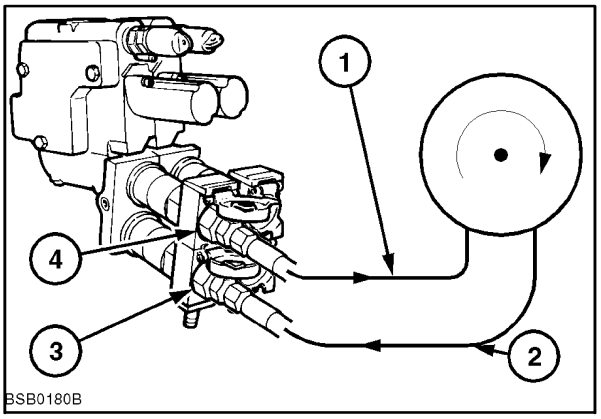


117

IMPORTANT: *Always use the 'float' position to lower a single-acting cylinder. The 'lower' position is for double-acting cylinders only.*

Connecting and Operating Continuous Flow Hydraulic Equipment - Figure 118

Continuous flow hydraulic equipment (e.g. hydraulic motors) should be connected to the remote control valve coupler with the **feed** hose (1) connected to the **upper** coupler (4) and the **return** hose (2) connected to the **lower** coupler (3) of the same valve.



118

Figure 119

With the remote control valve lever fully forward, in the 'float' position the motor will be stationary. The hydraulic motor will operate if the lever is moved to the 'lower' position.

IMPORTANT: *To stop the motor, move the lever fully forward to the 'float' position. The motor will then slow to a halt and not stop abruptly causing internal line pressures which, unless relieved by special valving, could damage the motor seals.*

Observe the following to further protect the tractor and equipment:

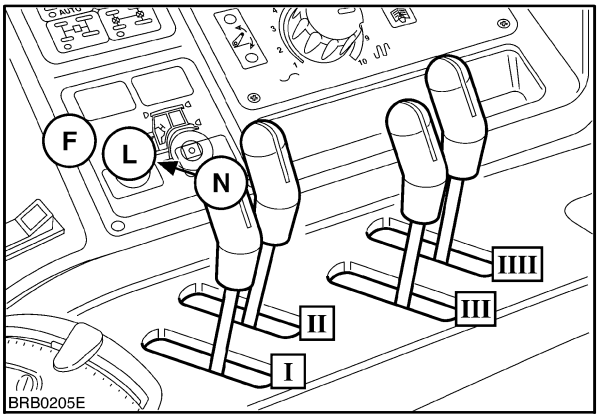
- Do not open any by-pass valve in the equipment or motor. Use the flow control valve to control the rate of flow or speed of the motor.

- To assure optimum hydraulic oil cooling and prevent overheating, operate continuous flow equipment at the highest flow setting (by use of the flow control valve) and lowest engine speed that will give the required machine performance and speed.

- It is recommended that a temperature gauge, where available, is installed in the remote circuit when using hydraulic motors for continuous operation. If over-heating occurs, stop the hydraulic motor until the oil cools. Ensure the flow control setting is at maximum and the engine speed at a minimum, appropriate to machine performance.

  If operating conditions are normal and high temperatures persist, install an oil cooler in the motor return circuit. The maximum recommended operating temperature of the oil is 110°C (230°F).

Your dealer can supply a suitable oil cooler and the necessary fittings or make the installation for you.



119

Operating Several Remote Valves Simultaneously or Remote Valves and Hydraulic Lift Simultaneously

If operating two or more remote control valves simultaneously or remote valves and the hydraulic lift, all the flow control valves should be adjusted to provide a partial flow. If not so adjusted, all the available flow may be directed to the full flow circuit when the pressure in that circuit is less than that of the other circuits in use.

Bleeding Remote Cylinders

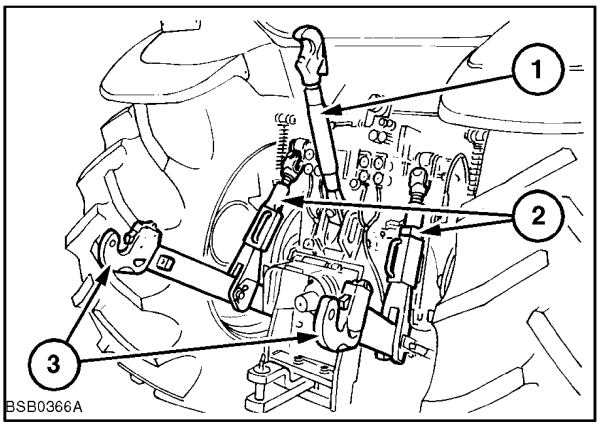
When connecting a cylinder with trapped air, i.e., a new cylinder, one that has been out of service or one that has had the hoses disconnected, it will be necessary to bleed the cylinder to remove the air.

With the hoses connected to the remote control valve couplers at the rear of the tractor, position the cylinder with the hose end uppermost and extend and retract the cylinder seven or eight times using the remote control valve operating lever.

Check the rear axle oil level before and after operating a remote cylinder.

THREE-POINT LINKAGE

NOTE: *Before attaching equipment read the following text, carefully.*



120

Description - Figure 120

The three-point linkage enables semi-mounted and fully mounted implements to be connected to the tractor, operated and controlled by the tractor hydraulic system. The linkage consists of two lower links (3) connected to a shaft in the rear axle housing. The rear ends of the lower links should be connected to the lower hitch pins on the implement. Various types of link end are available to aid implement connection.

The lower links are raised and lowered by means of the lift rods (2) connected to the lift arms. The lift arms may be readily adjusted to aid proper alignment of the implement to the tractor.

The top link (1) is connected to a bracket on the rear axle centre housing. The rear of the top link should be connected to the upper hitch pin of a mounted implement. The top link is also adjustable to aid implement alignment.

ATTACHING 3-POINT EQUIPMENT

NOTE: *Before attaching equipment, adjust lift rods and select the correct top link hole for the implement and work to be carried out.*

Ensure that the telescopic stabilisers or sway blocks are installed and correctly adjusted. Remove the swinging drawbar, if close-mounted equipment is being attached.

IMPORTANT: *Always select Position Control when attaching equipment, transporting equipment, when no equipment is attached or at any time when not operating in Draft Control.*

NOTE: *See also* 'External Power Lift Control' *on pages 3-37 and 3-55 for more details.*

Most equipment can be attached to your tractor as follows:

1. Position the tractor so that the lower link hitch points are level with and slightly ahead of the implement hitch pins.

2. Attach the implement to the lower links, as described in 'Flexible Link Ends' on page 3-70 or 'Walterscheid Hitch' on page 7-10.

⚠ CAUTION ⚠

Engage the parking brake before leaving the tractor to make the connections. It is essential to have the engine running to operate the external fender-mounted switches when making lower link connections. If your tractor does not have these switches or when making other connections, stop the engine.

IMPORTANT: *Before transporting or operating equipment, ensure that the flexible link ends (where fitted) are locked in the operating position.*

3. With the engine stopped and parking brake engaged, adjust the top link until the implement mast pin can be inserted through the mast and top link. Adjust the top link to the initial 724 mm (28.5 in.) setting.

4. Connect remote equipment, where applicable.

5. After attaching implement and before actual operation check that:

- No interference occurs with tractor components.

- The top link does not contact the PTO guard with the implement at its lowest position.

IMPORTANT: *Before operating PTO driven equipment, check to make sure that the PTO driveline will not over-extend so as to become disengaged, bottom out or be at an excessive angle. Ensure that the driveline shield does not contact the PTO guard or drawbar. See* 'Attaching P.T.O.-Driven Equipment' *on page 3-11.*

IMPORTANT: *When attaching mounted or semi-mounted equipment to the 3-point linkage or when attaching trailed equipment to the drawbar or hitch, ensure that there is adequate clearance between the implement and the tractor. Semi-mounted or trailed equipment may interfere with the tractor rear tyres. If necessary, adjust steering stops (four wheel drive only), sway blocks or stabilisers.*

IMPLEMENT TO CAB CLEARANCE

⚠ CAUTION ⚠

Some mounted and semi-mounted equipment may interfere with or damage the cab. You may be injured by broken glass or the cab ROPS may be damaged if equipment interferes with the cab.

To prevent cab damage, proceed as follows:

- Attach the equipment as outlined previously.

- Check for adequate clearance by slowly raising the equipment with the lift control lever in Position Control. If any part of the equipment comes closer than 100 mm (4 in.) to the cab, adjust the 3-point hitch height limiter cam (page 3-33) or height limit control knob (page 3-50) to limit upward movement.

When removing equipment, the procedure is the reverse of attaching. The following information will make disconnection easier and safer.

- Always park the equipment on a firm, level surface.

- Support equipment so that it will not tip or fall when detached from the tractor.

- Always relieve all hydraulic pressure in remote cylinders by selecting the float position before disconnecting.

When attaching mounted equipment to the three-point linkage, the following adjustments may be made to ensure satisfactory operation:

LIFT RODS, LOWER LINKS AND TOP LINK (mechanical adjust)

CAUTION

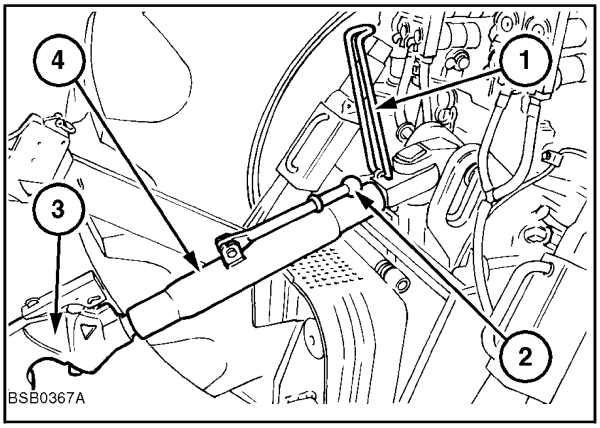
Before disconnecting a lift rod from the lower link, stop the engine and lower attached equipment to the ground. Before removing the securing pin, ensure that attached equipment is correctly supported and that no residual pressure remains in the hydraulic system.

Move the hydraulic lift control lever backwards and forwards several times, in order to remove residual pressure, then move the lever fully forward.

When adjusting lift rods, ensure that at least 40 mm (1.6 in.) of thread remains engaged in the lower end of the lift rod assembly.

Top Link - Figure 121

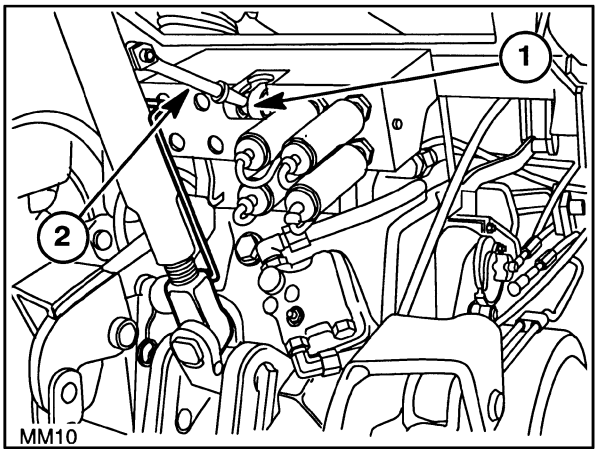
Hold the link end (3) and rotate the sleeve (4) to lengthen or shorten the top link. Pull the locking latch (1) away from the sleeve to allow the sleeve to turn. To prevent further rotation of the sleeve after adjustment, push the latch back to engage the transport hanger (2).



121

Figure 122

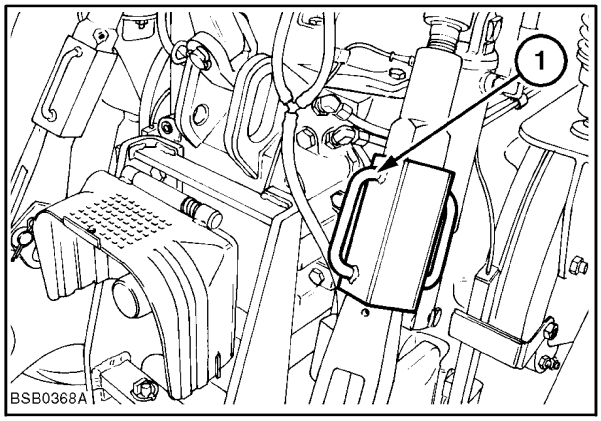
When not in use, the top link can be removed and stored or left in an upright position and retained by hooking the ball end of the transport hanger (2) into the bracket (1) on the remote control valve housing.



122

Lift Rod Adjustment

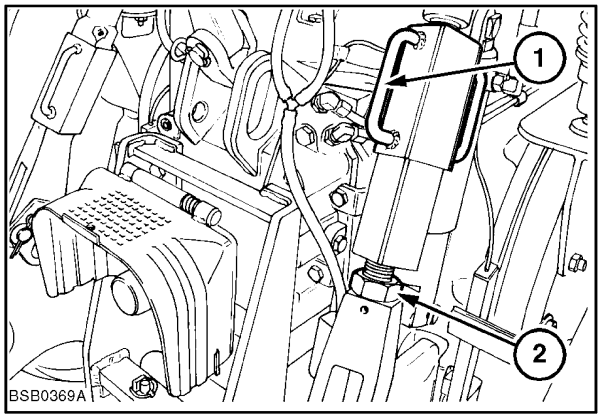
Figure 123
The lift rods are adjusted by rotating the upper part of the lift rod by means of the handle (1) on the turnbuckle.



123

Figure 124
Before the turnbuckle can be rotated, it is necessary to lift the turnbuckle (1) to disengage it from the hexagon (2) on the lower section of the lift rod. Rotate the turnbuckle to lengthen or shorten the lift rod assembly.

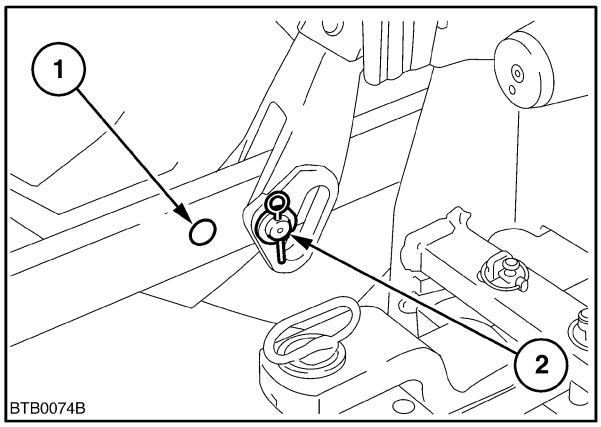
When adjustment is satisfactory, allow the turnbuckle to lower into position. Ensure that the turnbuckle is fully down and engages with the hexagon to prevent unintentional rotation.



124

Figure 125
Each lower link has two holes for attaching the lift rods. Attach the lift rods to the front hole (nearest the tractor - as shown) for maximum lift height. Use the rear hole (1) for maximum lift capacity.

NOTE: *Both left and right-hand lift rods may have a slot as well as a round hole at the lower end. If the securing pin (2) Figure 125, is inserted through the slotted hole this will allow an implement limited vertical movement independent of the tractor to facilitate the operation of wide implements.*

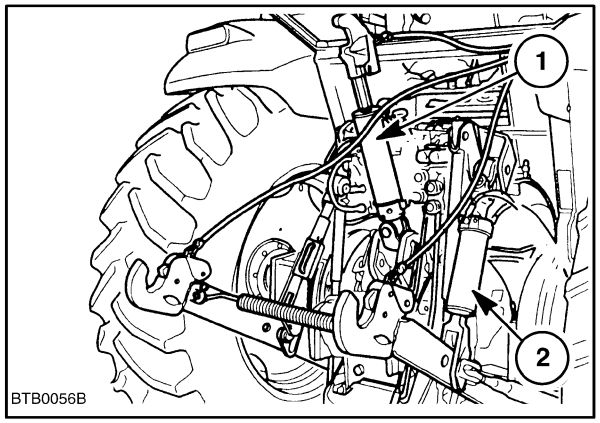


125

IMPORTANT: *When attaching mounted or semi-mounted equipment to the 3-point linkage or when coupling trailed equipment to the drawbar or automatic pick-up hitch, ensure that there is adequate clearance between the implement and the cab or rear window in any open position.*

TOP LINK AND RIGHT-HAND LIFT ROD (hydraulic adjust) - Figure 126

The hydraulic adjust top link (1) is available in conjunction with a hydraulic adjust right-hand lift rod (2). Both the top link and the lift rod incorporate a double-acting ram cylinder connected into No. IIII remote control valve.

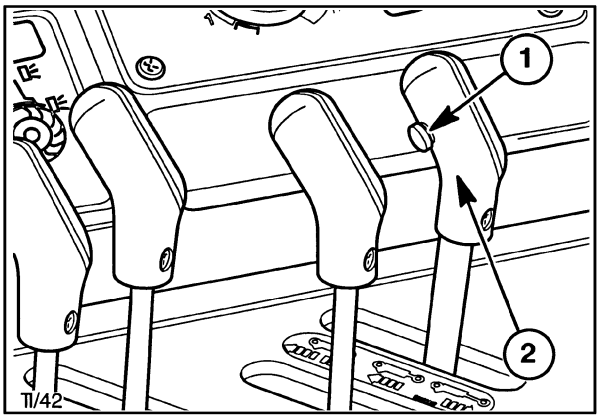


126

Figure 127

To adjust the length of the top link, pull No. IIII remote control valve lever (2) toward you, to the raise position, to lengthen the top link assembly. Push the lever away from you, past the neutral position to retract the cylinder and shorten the top link assembly.

To adjust the length of the right-hand lift rod, hold in the button (1) on No. IIII remote control valve lever (2). Movement of the remote valve lever will now cause the cylinder on the right-hand lift rod to extend or retract. Pull the lever toward you to the raise position to lengthen the right-hand lift rod. Push the lever away from you, past the neutral position to retract the cylinder and shorten the right-hand lift rod.

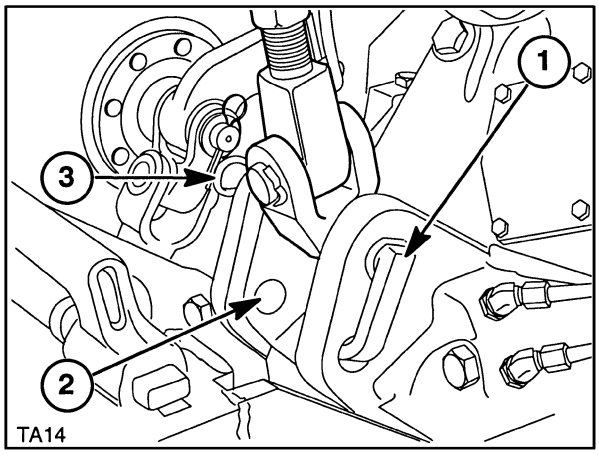


127

TOP LINK BRACKET (all models)
- Figure 128
Two holes are provided in the bracket for attachment of the top link.

Insert the pin (1) through the upper hole, as shown, for maximum lift capacity and the greatest implement to cab clearance. Use the lower hole (2) for the best ground penetration and greatest implement to ground clearance (when the implement is raised).

To relocate the top link, pull out the 'R' clip (3) and extract the securing pin. Relocate the top link and pin, as required, ensuring that the tang on the end of the securing pin handle locates in the other hole.



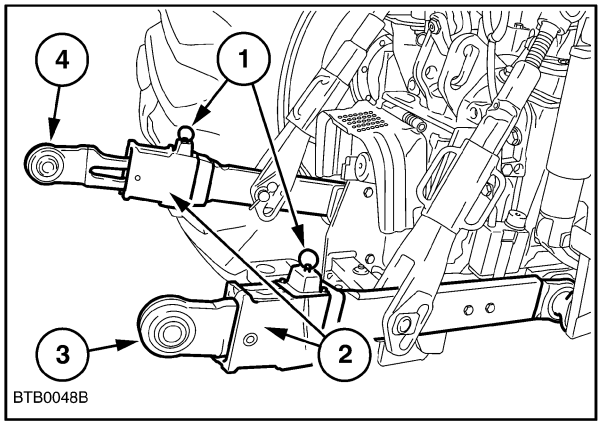
128

NOTE: *If your tractor is equipped with an automatic pick-up hitch, the pin may foul the hitch lift rods during removal. If necessary, use hydraulic power to move the hitch lift rods to permit removal of the top link securing pin.*

FLEXIBLE LINK ENDS (where fitted) - Figure 129
A release ring (1) is provided on the upper surface of each lower link (2). Pull the rings (1) up to release the link ends. With the link ends released, connection to the implement will be easier. The link end (4) is shown in the extended position. The link end (3) is shown in the closed (operating) position.

With both link ends extended, as at (4), connect the link ends to the equipment and secure with linch pins. Start the engine and carefully inch the tractor rearwards until both flexible link ends lock in the operating (closed) position (3). Stop the engine and engage the parking brake.

Attach the top link.



129

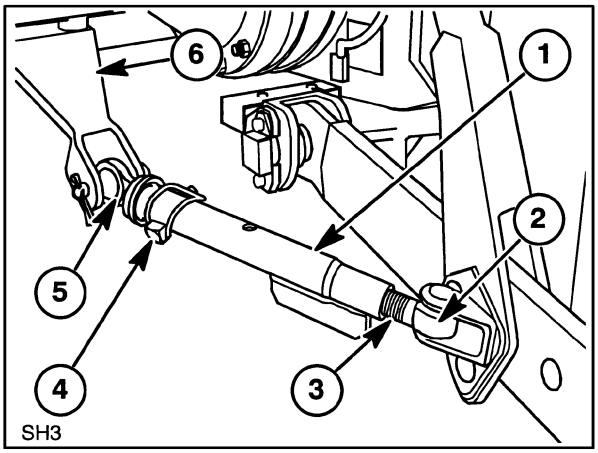
IMPORTANT: *Before transporting or operating the equipment, make sure the flexible link ends are locked in the operating position. Remove the drawbar if it interferes with close-mounted equipment.*

TELESCOPIC STABILISERS (where fitted) - Figures 130 and 131

CAUTION

Never operate steerable equipment unless the telescopic stabilisers are installed and correctly adjusted to prevent excessive lateral movement.

Telescopic stabilisers control the sway of the lower links and attached equipment when in work or when being transported. This is especially important when operating on slopes or near fences, walls or ditches and with certain implements. Check your Implement Operator's Manual.



130

Figure 130
Each stabiliser consists of a fabricated tube (1) with a ball coupling at each end. The ball end (2) is attached to the 3-point linkage. The screw thread (3) screws into the rear end of the tube to provide adjustment. The ball end (5) is attached to a mounting bracket (6) bolted to the outer end of the rear axle housing. This ball end is a loose, sliding fit within the tube. The pin (4) may be passed through drillings in the tube and rod, as shown, to lock the assembly as a unit.

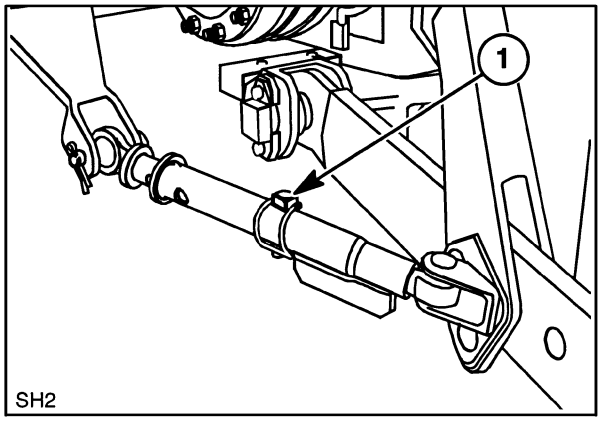
In practice, the locating pin (4) should be removed from both stabilisers and the implement attached to the 3-point linkage. To remove the pin, pull back the securing clip. When the implement is satisfactorily aligned, the tube should be rotated until the holes in the front end of the tube and the sliding ball end are aligned. The locating pin should then be passed through the holes and the securing clip replaced.

With the pins inserted in this manner, both stabilisers will be locked as a rigid unit and the implement will be prevented from swaying both in work or in the transport position.

Under certain conditions or when using equipment such as ploughs etc., it may be desirable to allow the 3-point linkage (and implement) to sway from side to side.

Figure 131
If the pin is removed from the front, horizontal holes, a limited degree of sway will be permitted. The pin should be re-inserted through the rear, vertical holes, as shown at (1). The pin will act as a stop to limit the degree of sway.

IMPORTANT: *When setting the stabiliser length, particularly if using the sway facility, ensure that there is no possibility of the rear tyres fouling the stabilisers or lower links.*



131

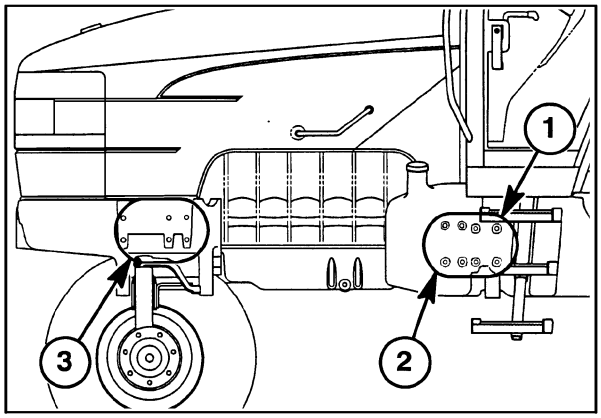
EQUIPMENT MOUNTING POINTS

Figure 132
Your tractor is provided with a number of threaded holes for the purpose of attaching optional equipment. Figure 132 shows the mounting points on the left-hand side of the tractor. There are matching threaded holes on the right-hand side.

The size of the holes shown is as follows:

(1) Cab attachment point (see note below).
(2) Four holes M20 x 2.5 - 36 mm deep
(3) Six holes M20 x 2.5 - 48 mm deep.

NOTE: *Holes (1) should not be used to attach equipment.*

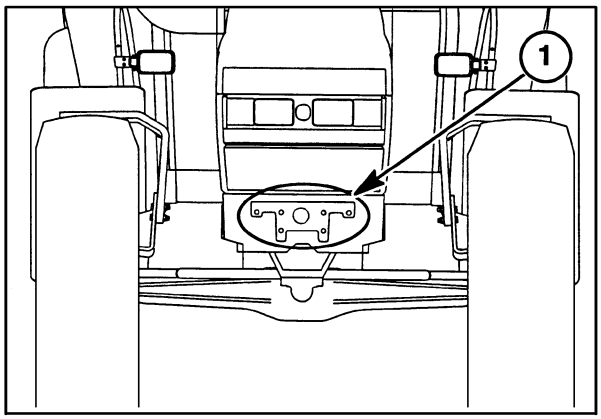


132

Figure 133
The size of the holes shown is as follows:

(1) Six holes M20 x 2.5 - 46 mm deep.

NOTE: *If you have front end weights on your tractor then holes (1) will have already been utilised for the weight carrier.*



133

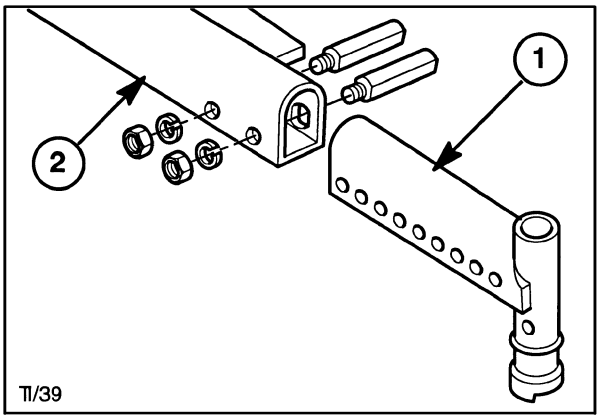
TRACK ADJUSTMENT (two wheel drive)

CAUTION

Your tractor is produced with lights that meet lighting regulations when operating or travelling on the public highway. If the wheel track setting is adjusted beyond the initial factory position then you may be required to reposition the lights or fit auxiliary lighting to comply with legal requirements. Additionally, before travel-ling on the highway, ensure that the overall tractor width does not exceed the maximum permitted in your country.

Description - Figure 134

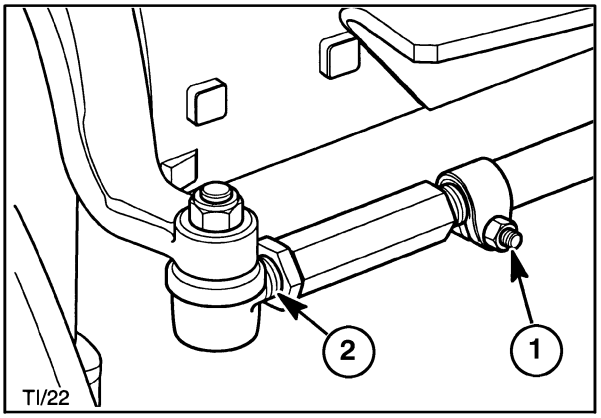
The front axle consists of a hollow centre beam (2) with a telescopic section (1) at each end. A number of holes at 50 mm (2 in.) intervals are provided in the telescopic sections for adjustment purposes. Adjustment of the front wheel track width is effected by extending **both** ends of the axle **equally**.



134

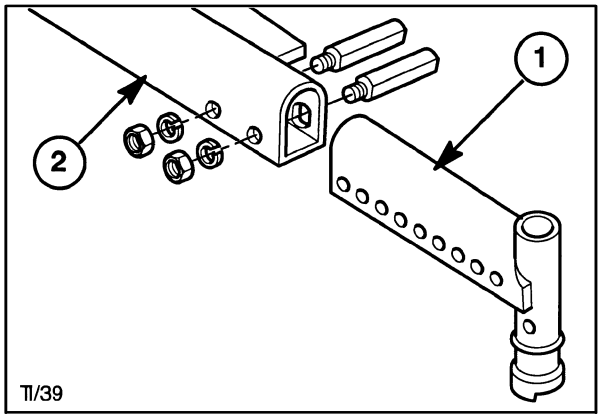
Figure 135

The track control rod is adjustable and consists of a central, hollow tube with a solid, extendible section at each end. The left-hand end of the track control rod has a number of notches at 50 mm (2 in.) intervals. A locating bolt (1), passing through a clamp and one of the notches in the solid section, locks the track rod assembly at the desired length. Additionally, both ends of the track rod are threaded (2) to provide fine adjustment.



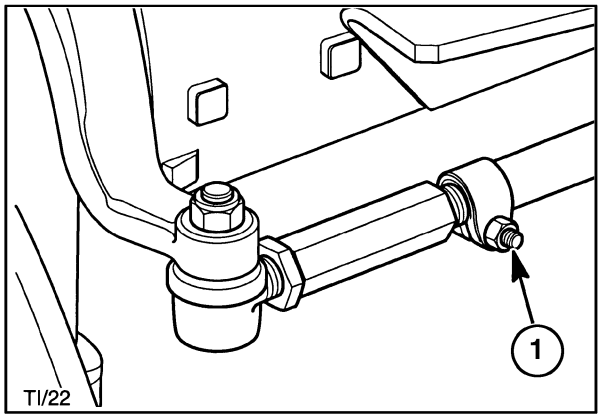
135

Adjustment - Figure 136
To extend the axle, apply the handbrake and block the rear wheels. Jack up the front axle and place on axle stands. Remove the nuts, bolts and washers securing the left-hand telescopic section (1) to the centre beam (2). Repeat on the right-hand side of the axle.



136

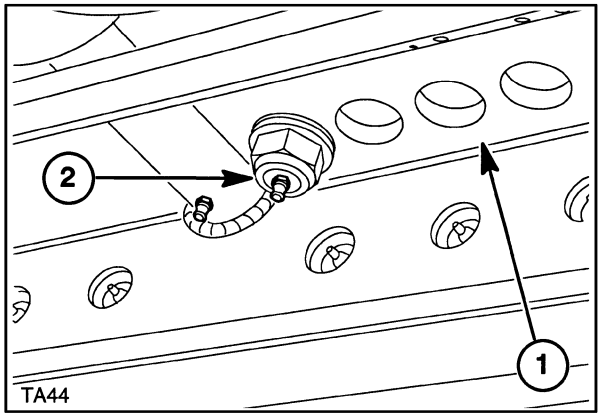
Figure 137
Remove the locating bolt (1) from the left-hand end of the track rod. This will permit the track rod to extend or retract freely.



137

Figure 138
The power steering cylinder, located behind the axle, must be disengaged to permit adjustment of the axle.

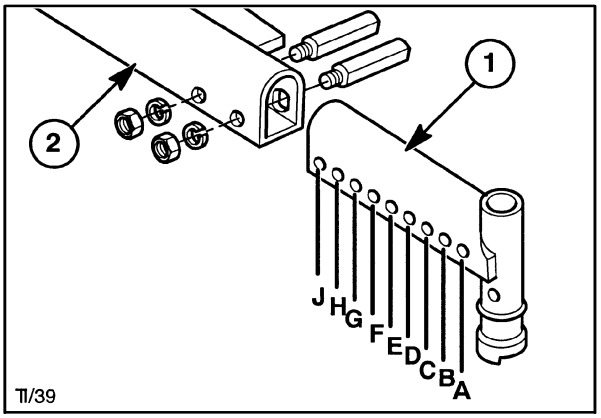
The power steering cylinder is attached to the axle centre beam by a pivot pin (2) passing through one of nine holes drilled in the support bracket (1). When the right-hand end of the axle is moved, the power steering cylinder must be moved by the same number of holes. For example, if the right-hand end of the axle is moved 3 holes to the right then the steering cylinder must also be moved to the right by 3 holes.



138

Figure 139
Reset the left- and right-hand axle telescopic sections, passing the securing bolts through the centre beam and telescopic sections, as indicated in Figure 139 and the following table:

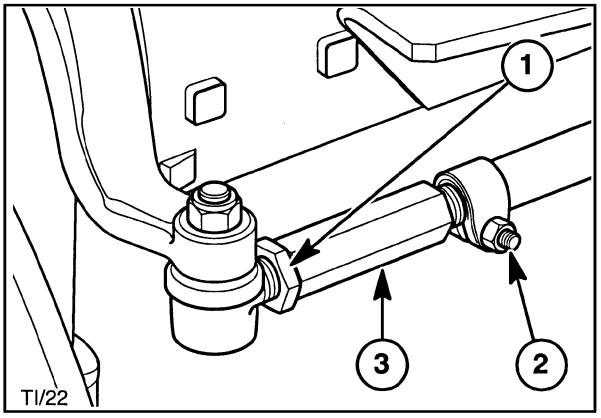
Track Setting mm	(in.)	Securing Bolt Locations Refer to Figure 139	
1545	(60.8)	A	C
1645	(64.8)	B	D
1745	(68.7)	C	E
1845	(72.6)	D	F
1945	(76.6)	E	G
2045	(80.5)	F	H
2145	(84.5)	G	J



139

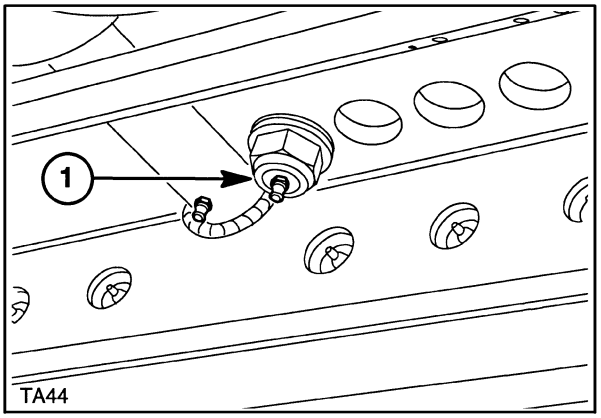
NOTE: *The track settings shown may vary by up to 5 mm (0.2 in.), dependent upon tyre size. The front wheel discs are offset relative to the centre line of the rim. The track settings in the tables above are with the dished side of the wheel nearest the axle hub. If the front wheels are reversed on the hubs the track settings shown in the tables will be increased by approximately 45 mm (1.8 in.).*

Tighten the nuts on the axle extension securing bolts to 410 Nm (302 lbf.ft.).



140

Figure 140
With both front wheels parallel, install the locating bolt (2) in the nearest aligning notch in the track control rod. Tighten the nut on the locating bolt to 45 Nm (33 lbf. ft.).



141

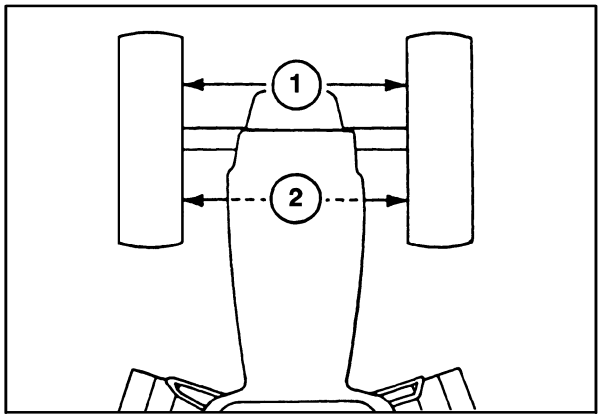
Figure 141
Tighten the power steering cylinder pivot pin nut (1) to 294 Nm (217 lbf.ft.). Recheck the torque after 50 hours of operation.

Tighten the wheel disc to hub bolts to 300 Nm (220 lbf. ft.)

Recheck all torque settings after 50 hours of operation.

Front Wheel Toe-in

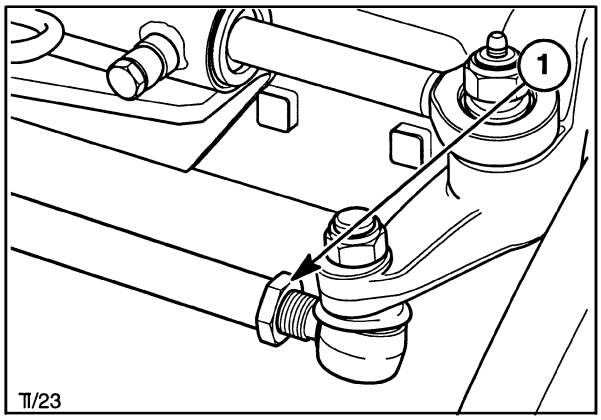
After resetting the track width, adjust the front wheel toe-in. For correct operation, the front wheels should be parallel or toe in slightly.



142

Figure 142

Measure the distance (1) between the wheel rims at hub height at the **front** of the wheels. Rotate both front wheels 180° and check the measurements again, this time at the **rear** of the wheels (2). This will eliminate wheel rim run-out errors. The correct toe-in setting is 0 - 13 mm (0 - 0.5 in.), i.e. the measurement taken at the front of the rims should be the same as the rear or be smaller by up to 13 mm (0.5 in.).



143

Figure 143

Loosen the locknut (1) at the right-hand end of the track rod.

Figure 144

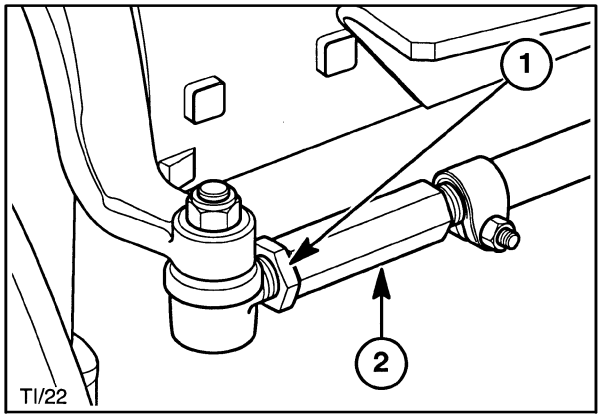
Loosen the locknut (1) at the left-hand end of the track rod.

Turn the hexagon adjuster (2) to shorten or lengthen track rod assembly until the toe-in is correct.

Tighten the locknuts at both ends of the track rod to 176 Nm (130 lbf. ft.). Recheck the torque settings after 50 hours of operation.

⚠ CAUTION ⚠

Owners should ensure that all steering components are maintained in a reliable and satisfactory condition to ensure safe operation and comply with legal requirements.



144

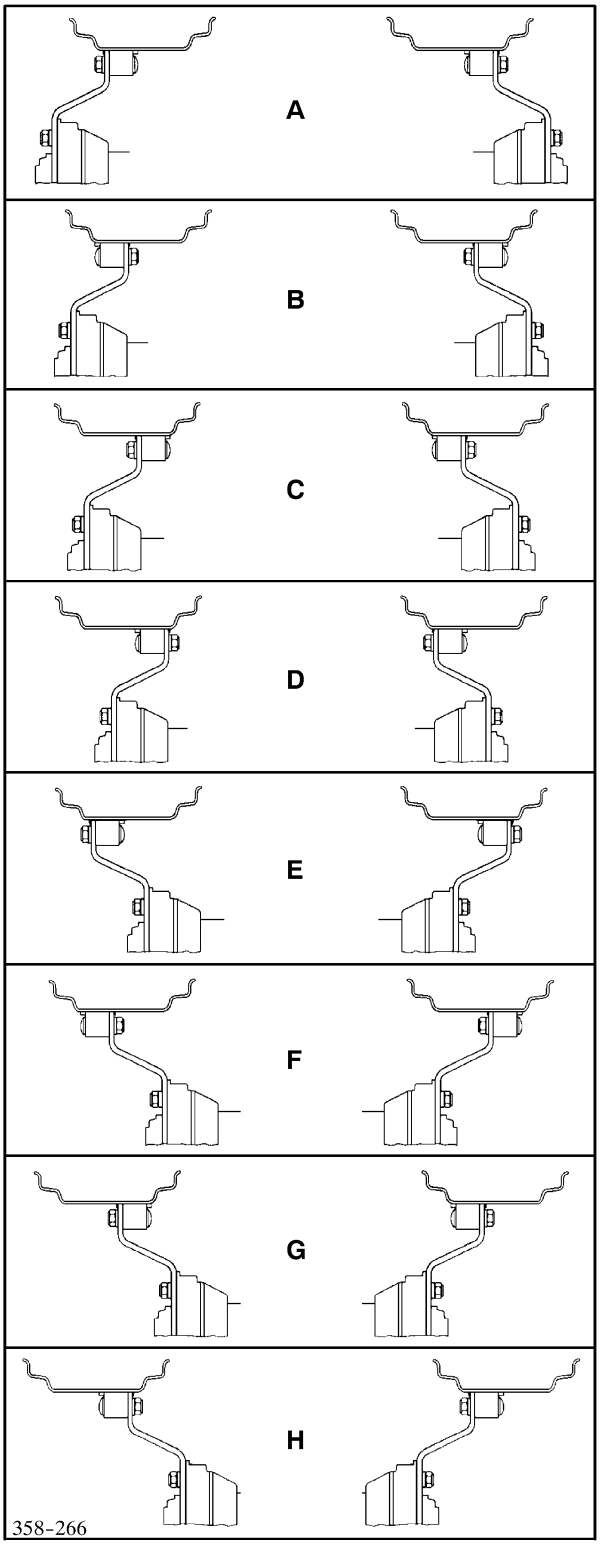
TRACK ADJUSTMENT (four wheel drive)

WARNING

With a front wheel on a four wheel drive tractor supported on a stand, never attempt to rotate the wheel or start the engine. This may cause the rear wheels to move resulting in the tractor falling from the stand. Wheels should always be supported such that the tyres are only just clear of the ground.

NOTE: *When interchanging left and right-hand wheel assemblies, ensure the "V" at the top of the tyre tread remains pointing in the direction of forward travel.*

Front wheel drive tractors have fixed axle assemblies. However the track width is fully adjustable by changing the wheel rim relative to the centre disc, the rim and/or disc relative to the axle hub or by inter-changing both front wheels. (The track width is the distance between the centre of each tyre at ground level).



145

Figure 145
The sectioned drawings shown illustrate the wheel rim and disc positions relative to the hub at various track settings. The track widths available are as follows:

Setting	Track Width
A	1552 mm (61.1 in.)
B	1664 mm (65.5 in.)
C	1758 mm (69.2 in.)
D	1869 mm (73.6 in.)
E	1952 mm (76.9 in.)
F	2064 mm (81.3 in.)
G	2158 mm (85.0 in.)
H	2269 mm (89.3 in.)

NOTE: *The track widths in Figure 145 above, are nominal and may vary by up to 25 mm (1 in.) dependent upon tyre size.*

WARNING

Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals. Owners should ensure that all steering components are maintained in a reliable and satisfactory condition to ensure safe operation and comply with legal requirements.

When refitting or adjusting a wheel, tighten the bolts to the following torques then re-check after driving the tractor for 200 yards (200 m), after 1 hour and 8 hours operation and, thereafter, at the 50 hour service intervals:

Disc to hub nuts	210 Nm (155 lbf.ft.)
Disc to rim nuts	240 Nm (177 lbf.ft.)

NOTE: *If your tractor is equipped with front fenders, ensure there is adequate clearance under all operating conditions. Adjust the steering stops and or fender position, as necessary.*

IMPORTANT: *At the narrower track settings a foul condition may occur between the tyre or fender and the tractor when the wheels are turned to the full lock position particularly when the axle is fully articulated. To avoid this condition, adjust the fenders and/or steering stops.*

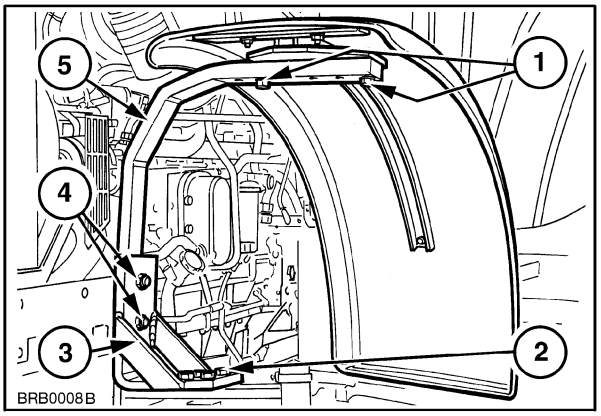
Dynamic Front Fenders (where fitted)

The optional dynamic front fenders turn with the front wheels as the tractor is steered. As the steering angle increases, linkage restricts the turn angle of the fenders to prevent interference with the tractor hood while allowing the wheels to continue to turn beneath the fender. This results in a tighter turn than would otherwise be possible with conventional fenders, particularly at narrower track settings.

The fenders are adjustable to suit varying tyre sizes and track width settings, as follows:

Lateral adjustment - Fig. 146

A fender may be moved horizontally, towards or away from the tractor, by relocating the bolts (1) in an alternative pair of holes in the fender support (5). Additionally, the mounting bracket (3) is attached to the front axle by four bolts (2). Relocation of these bolts in another set of holes will allow the complete fender assembly to be moved laterally.

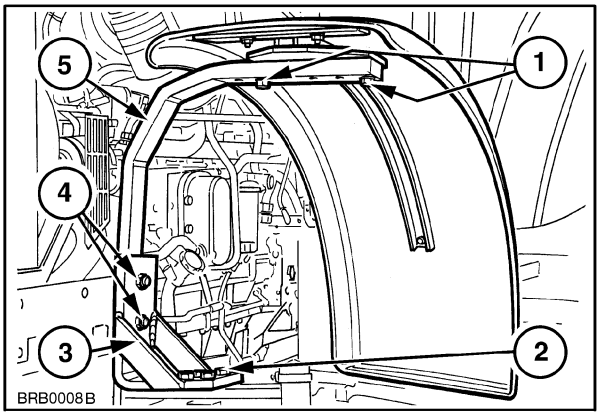


146

Vertical adjustment - Fig. 147

The fender may be moved vertically by relocating the bolts (4) in the appropriate holes in the fender support (5).

NOTE: *After adjustment, ensure that there is at least 60mm (2.4 in.) clearance between the tyre and any part of the fender or attaching hardware. Tighten all fixing bolts.*



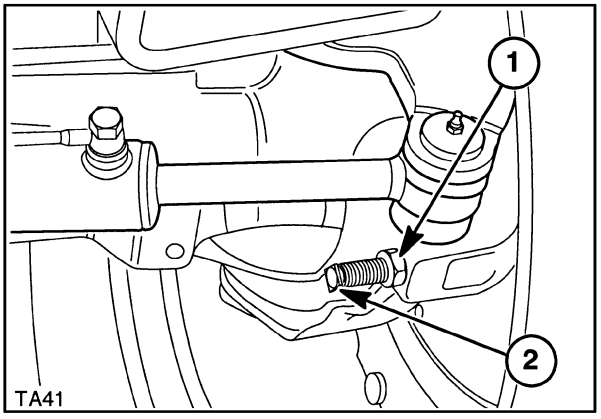
147

Steering Stops - Figure 148

Two steering stops are incorporated in the axle, one at each end. The stops are adjustable and should be set to provide a minimum clearance of 20 mm (0.75 in.) between the tyres and any part of the tractor on full left and right lock with the axle fully articulated.

To adjust, slacken the locknut (1) and turn the stop bolt (2) anti-clockwise to reduce the steering angle of the wheels or clockwise to increase the steering angle. Tighten the locknut to 150 Nm (110 lbf. ft.).

NOTE: *After adjusting both steering stops, ensure that there is adequate clearance between the tyres and any part of the tractor with the axle fully articulated.*



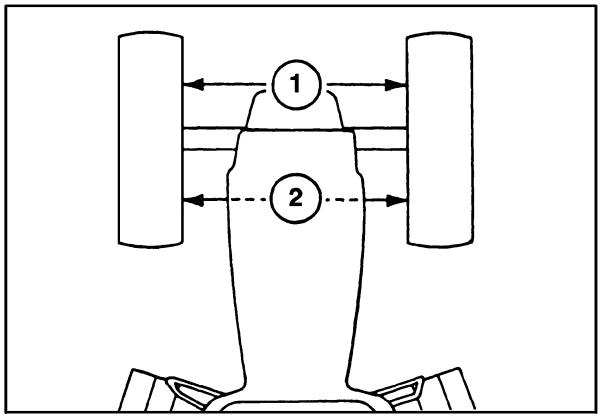
148

Front Wheel Toe-in

After resetting the track width, the front wheel toe-in may require adjustment. For correct operation, the front wheels should be parallel or toe **in** slightly.

Figure 149

Measure the distance (1) between the wheel rims at hub height at the **front** of the wheels. Rotate both front wheels 180° and check the measurements again, this time at the **rear** of the wheels (2). This will eliminate wheel rim run-out errors.



149

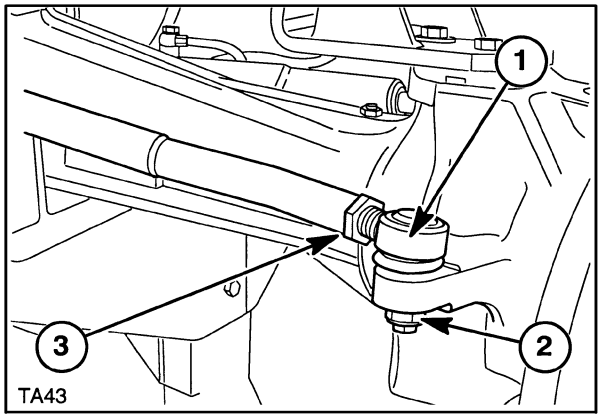
The correct toe-in setting is 0 - 6 mm (0 - 0.25 in.), i.e. the measurement taken at the front of the rims should be the same as the rear or be smaller by up to 0.25 in. (6 mm).

Should it be necessary to adjust the front wheel toe-in, proceed as follows:

Figure 150

Remove and discard the self-locking nut (2) on the left-hand end of the track control rod and extract the track rod end (1).

Loosen the lock nut (3) and screw the track rod end into or out of the track rod to shorten or lengthen the assembly, as required.



150

Re-insert the track rod end and, when the toe-in setting is correct, secure with a new self-locking nut.

Tighten the nuts to the following torques:

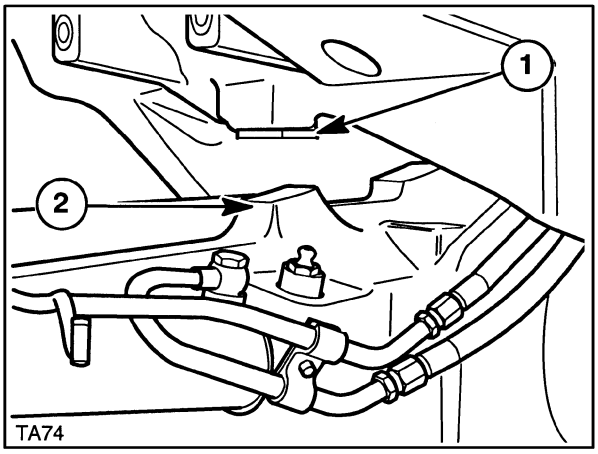
Tractor model	Self-locking nut (2)	Lock nut (3)
TM115, TM125 and TM135	98 Nm (72 lbf. ft.)	177 Nm (130 lbf. ft.)
TM150 and TM165	118 Nm (87 lbf. ft.)	196 Nm (145 lbf. ft.)

Front Axle Oscillation Stops - Figure 151

Axle oscillation stops are installed, one each side of the axle. Each stop consists of a plate (1), secured to the underside of the front axle support by two flush fitting, socket head screws. Oscillation of the axle causes the stop plate to contact the projection (2) on the axle casing, so preventing further movement. With the stop plates in position, as shown, axle oscillation is 8°.

Extract the screws and remove the stop plates to increase axle oscillation to 12°.

NOTE: *If the oscillation stops are removed, ensure that there is adequate clearance between the front tyres and any part of the tractor with the axle fully articulated.*



151

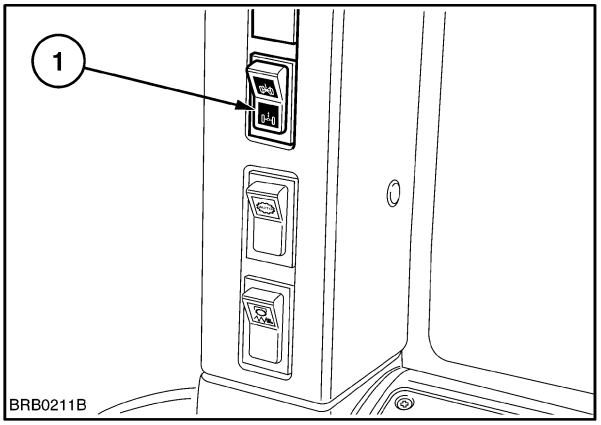
TERRAGLIDE™ FRONT AXLE SUSPENSION - Figure 152

The optional, self-levelling, front axle suspension will provide improved stability, control, comfort and traction. Terraglide is automatically activated each time the tractor is started but will not function at speeds below 1.5 km/h (0.9 MPH).

When operating at speeds up to 12 km/h (7.4 MPH), the front axle suspension may be locked out if not required. A warning light in the switch will indicate lock out is engaged.

To lock out the suspension, press the top of the switch (1) on the right-hand 'B' pillar. Press the top of the switch again to reactivate the suspension facility.

At speeds above 12 km/h (7.4 MPH), the suspension will automatically re-engage, overiding axle lock out. In this situation the warning light will remain on.



152

NOTE: *Should the lock out switch warning light begin to flash, this would indicate a malfunction of the suspension system. Consult your authorised dealer.*

⚠ WARNING ⚠

Hydraulic oil in the front axle suspension system operates under very high pressure. Escaping hydraulic oil under pressure can penetrate the skin causing serious injury. Unqualified persons should not attempt to disconnect any pipework in the front axle hydraulic system. Failure to follow these instructions can result in serious injury.

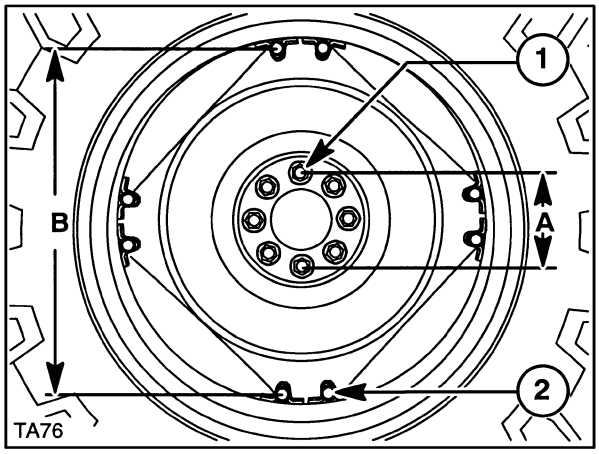
⚠ WARNING ⚠

If a transmission ratio is engaged, with the engine running and the tractor supported on axle stands, the self-levelling function of the suspension may cause the axle to make corrections (move up and down). The suspension should be locked out to maintain stability.

INSTALLATION OF ROWCROP WHEELS, CAGE WHEELS, ETC., TO THE FRONT AXLE - Figure 153

NOTE: *You may wish to install rowcrop wheels, cage wheels, etc., that clamp or bolt on to the existing tractor wheel hubs, discs or rims. The installation of dual front wheels is not approved by New Holland. Owners should also be aware that other manufacturers' wheel equipment has not been tested by New Holland Engineering and Field Test Operations.*

The table below and Figure 153 provide details of the relevant tractor wheel dimensions.



153

Wheel size	Available tyre sizes	TM115, TM125 and TM135 Tractors				TM150 and TM165 Tractors			
		Stud size (1)	Dia. 'A' mm (in)	Bolt size (2)	Dia. 'B' mm (in)	Stud size (1)	Dia. 'A' mm (in)	Bolt size (2)	Dia. 'B' mm (in)
W12L-24	14.9-24	M16	330 (13.0)	M16	515 (20.27)	-	-	-	-
W12-28	13.6-28	M16	330 (13.0)	M16	616 (24.25)	-	-	-	-
	14.9-28					M16	405 (15.95)	M16	616 (24.25)
	380/70-28					-	-	-	-
	420/70-28					M16	405 (15.95)	M16	616 (24.25)
	480/65-28					M16	405 (15.95)	M16	616 (24.25)
W15L-28	16.9-28	M16	405 (15.95)	M16	616 (24.25)	M16	405 (15.95)	M16	616 (24.25)
	480/70-28	-	-	-	-				
	540/65-28	-	-	-	-				
DWW13-30	14.9-30	-	-	-	-	M16	405 (15.95)	M16	616 (24.25)

REAR WHEEL TRACK ADJUSTMENT (manual adjust wheels)

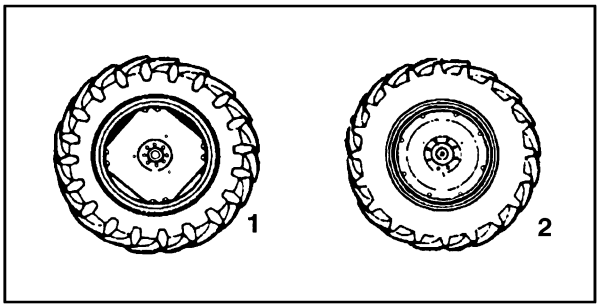
CAUTION

Your tractor is produced with lights that meet lighting regulations when operating or travelling on the public highway. If the wheel track setting is adjusted beyond the initial factory position then you may be required to reposition the lights or fit auxiliary lighting to comply with legal requirements. Additionally, before travelling on the highway, ensure that the overall tractor width does not exceed the maximum permitted in your country.

Rear wheel track adjustment is effected by changing the wheel rim relative to the centre disc, the rim and/or the disc relative to the axle hub or by inter-changing the rear wheels.

CAUTION

Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot topple and cause injury.



154

Figure 154

Note: There are two different designs of centre disc dependent upon tyre size and tractor model. The centre discs shown are as follows:

Square centre disc (type 1)
TM115 and TM125: all tyre sizes.

Round centre disc (type 2)
TM135, TM150 & TM165: all tyre sizes.

The type of centre disc installed will affect the track setting. Identify the type of centre disc fitted to your tractor wheels (Figure 154), then refer to the following table and Figure 155 to see the wheel rim and disc positions necessary to achieve the required track setting.

Figure 155
The sectioned drawings shown, illustrate the wheel rim and disc positions relative to the hub at various track settings.

IMPORTANT: *When interchanging left and right-hand wheel assemblies, ensure the "V" of the tyre tread remains pointing in the direction of forward travel.*

Track setting Figure 155	Disc type 1 Figure 154	Disc type 2 Figure 154
A	1530 mm (60.2 in.)	1530 mm (60.2 in.)
B	1734 mm (68.3 in.)	1632 mm (64.2 in.)
C	1630 mm (64.2 in.)	1712 mm (67.4 in.)
D	1834 mm (72.2 in.)	1834 mm (72.2 in.)
E	1930 mm (76.0 in.)	1930 mm (75.9 in.)
F	2134 mm (84.0 in.)	2032 mm (80.0 in.)
G	2030 mm (79.9 in.)	2130 mm (83.8 in.)
H	2234 mm (88.0 in.)	2232 mm (87.8 in.)

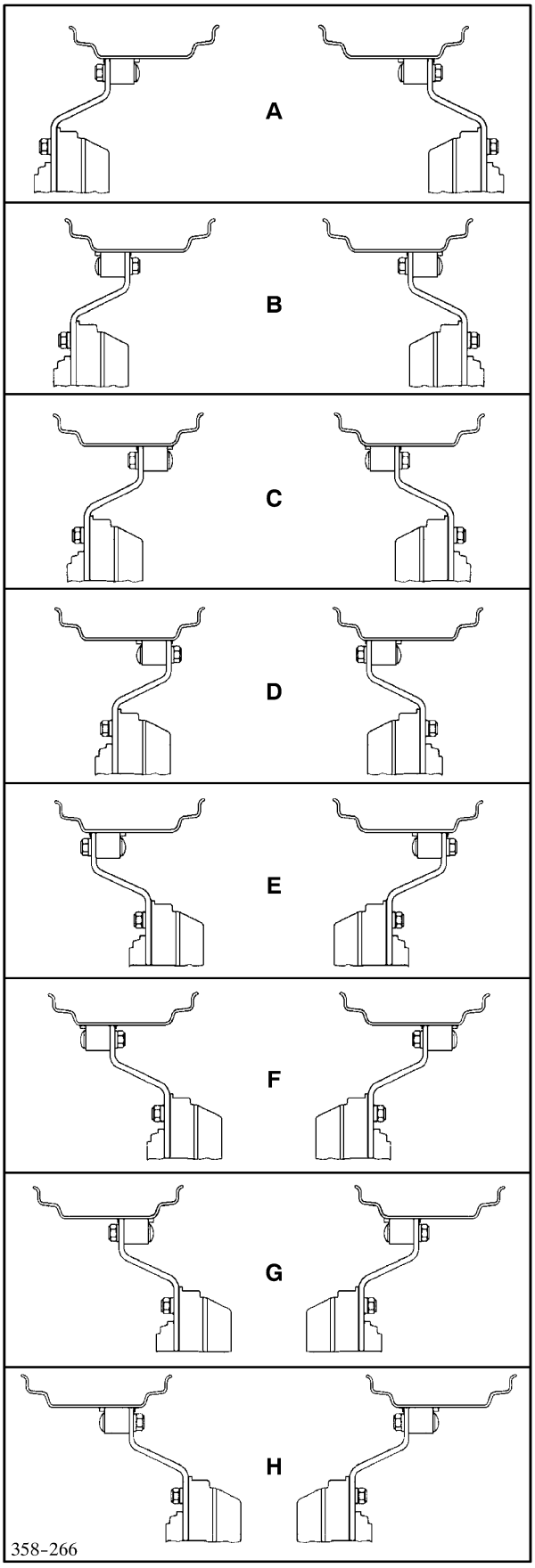
NOTE: *With the larger tyre sizes, the narrower track settings may not be attainable due to minimal clearance between tyres and fenders or equipment. The dimensions shown in the chart (Figure 155) are nominal. Track settings may vary by up to 25mm (1 in.), dependent upon tyre size.*

⚠ WARNING ⚠

Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

When refitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor for 200 m (200 yards), after 1 hour and 8 hours operation and thereafter at the 50 hour service intervals:

Rear disc to hub nuts	250 Nm (184 lbf. ft.)
Rear disc to rim nuts	
M16 nuts	240 Nm (177 lbf. ft.)
M18 nuts	450 Nm (330 lbf. ft.)

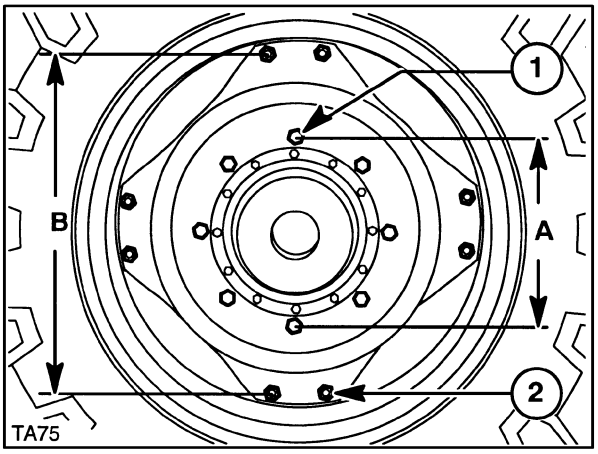


155

INSTALLATION OF DUAL WHEELS, ROW-CROP WHEELS, CAGE WHEELS, ETC. TO THE REAR AXLE – Figure 156

NOTE: *You may wish to install dual wheels, rowcrop wheels, cage wheels, etc., that clamp or bolt on to the existing tractor wheel hubs, discs or rims. Owners should be aware that such wheel equipment has not been tested by New Holland Engineering and Field Test Operations. Dual wheels are available for installation on the bar axle. See page 3-90.*

The table below and Figure 156 provide details of the relevant tractor wheel dimensions.



156

Wheel size	Available tyre sizes	TM115 and TM125 Tractors				TM135, TM150 and TM165 Tractors			
		Stud size (1)	Dia. 'A' mm (in)	Bolt size (2)	Dia. 'B' mm (in)	Stud size (1)	Dia. 'A' mm (in)	Bolt size (2)	Dia. 'B' mm (in)
DW15L-34	18.4-34	M18	203.2 (8.0)	M16	720.4 (28.36)	–	–	–	–
DW15L-38	16.9-38	M18	203.2 (8.0)	M16	822 (32.36)	–	–	–	–
	18.4-38	M18	203.2 (8.0)	M16	822 (32.36)	–	–	–	–
	420/70-38	M18	203.2 (8.0)	M16	822 (32.36)	–	–	–	–
	520/70-38	M18	203.2 (8.0)	M16	822 (32.36)	M18	275 (10.83)	M18	771.5 (30.375)
	600/65-38	–	–	–	–	M18	275 (10.83)	M18	771.5 (30.375)
DWW15-38	16.9-38	–	–	–	–	–	–	–	–
	18.4-38	–	–	–	–	–	–	–	–
	420/70-38	–	–	–	–	–	–	–	–
	520/70-38	–	–	–	–	M18	275 (10.83)	M16	818.4 (32.2)
	600/65-38	–	–	–	–	M18	275 (10.83)	M16	818.4 (32.2)
DW18L-38	20.8-38	–	–	–	–	M18	275 (10.83)	M18	771.5 (30.375)
	580/70-38	–	–	–	–				
	650/65-38	–	–	–	–				
DWW18L-38	20.8-38	–	–	–	–	M18	275 (10.83)	M18	819 (32.25)
	580/70-38	–	–	–	–				
	650/65-38	–	–	–	–				

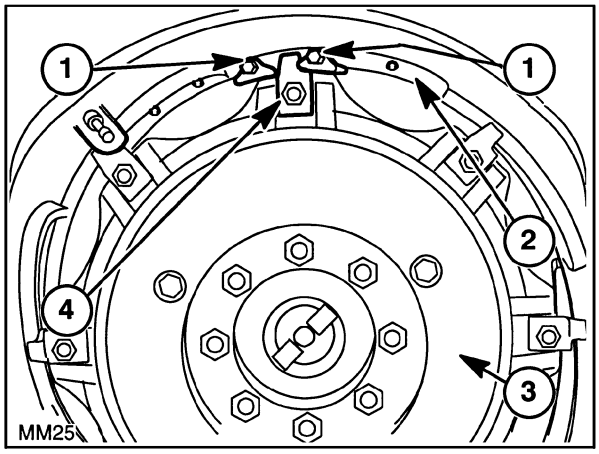
POWER ADJUST WHEELS (where fitted)

Dependent upon tractor model, power adjust wheels are available with a range of tyre sizes on 34 in. and 38 in. diameter rims. The advantage of these wheels is that the track width setting may be changed using engine power and without the need to jack up the tractor.

Power adjust wheels have cast iron centre discs and may be bolted directly to the rear axle flanges.

A power adjusted wheel is shown in Figure 157. Each wheel disc (3) is clamped to rails welded to the rim to form a helix. Movement of the clamps along the rails will cause the rim to move in or out, relative to the wheel disc which is bolted to the axle.

Two of the rails (2) have a number of holes drilled in them at set intervals. Each of the drilled rails has a pair of stops (1) that are normally screwed into adjacent holes, either side of a clamp. The stops serve to positively locate one of the clamps (4). Relocation of the stops from one hole to the next will, when all the clamp bolts have been loosened, allow the wheel disc to be rotated, relative to the rim and tyre to provide an alteration in track width.



157

Track Settings - 16 and 18 in. rims

The wheel discs are dished (concave) and the wheels are normally installed with the concave side toward the hub, as shown in Figure 157. This will provide a number of track width settings, as shown in the following table:

mm	(in.)
1624*	(63.9)*
1724	(67.9)
1824	(71.8)
1924	(75.8)
2024	(79.7)
2124	(83.6)
2224	(87.6)

* This setting available with 18.4 - 38, 20.8 - 38 and 520/70R38 tyres only due to reduced clearance with the larger tyre sizes.

Track Settings – 15 in. rims

By inter-changing the left and right wheels, when correctly installed, i.e., with the 'V' of the tyre tread facing forward, the convex side of the wheel disc will be in contact with the hub. This will have the effect of moving the wheel away from the tractor to provide an alternative, wider range of track width settings. See the following table:

Concave side of disc toward the tractor		Convex side of disc toward the tractor	
mm	(in.)	mm	(in.)
setting not attainable		1702	(67.0)
1522*	(59.9)*	1802	(70.9)
1622	(63.9)	1902	(74.9)
1722	(67.8)	2002	(78.8)
1822	(71.7)	2102	(82.8)
1922	(75.7)	2202	(86.7)
2022	(79.6)	2302	(90.6)

***** This setting available with 16.9 – 38 tyres only.

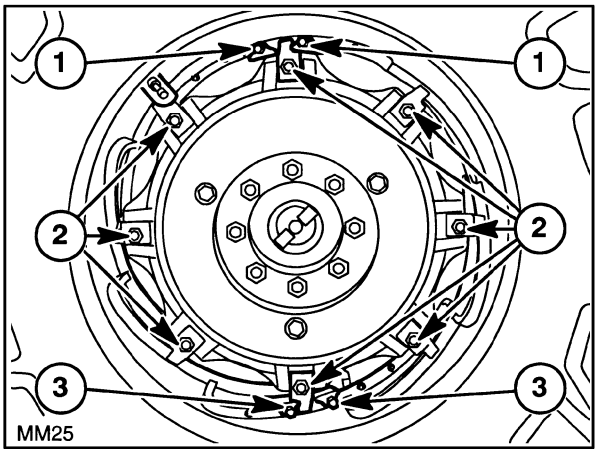
Power Adjust Procedure

IMPORTANT: *To power adjust a rear wheel, the drive to the front wheels must be* ***disengaged****. Ensure that the differential lock is disengaged before power adjusting a wheel.*

Power Adjusting a Left-hand Wheel – Figure 158

Position the left-hand wheel with a pair of stops at the top (1) and at the bottom (3), as shown in Figure 158. Loosen the nuts (2) on all the clamp attaching bolts.

If an **increase** in track width is required, remove the stop to the **right** of the **lower** clamp and to the **left** of the **upper** clamp. Relocate both clamps in the appropriate holes in the rail.



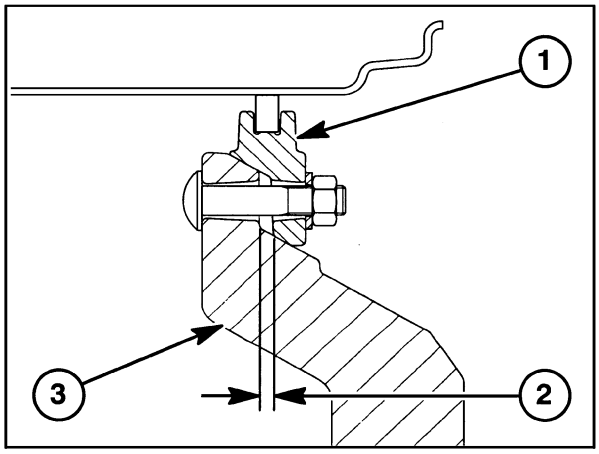
158

NOTE: *If the wheel is to be adjusted to the minimum or maximum setting within a range, then remove one stop from each pair. The bend in the end of the rail will act as a stop. The minimum track setting may not be attainable due to minimal clearance between tyres and fenders and/or the tractor.*

With the engine running, select a low **forward** gear, apply the r**ight-hand** footbrake, release the hand-brake and engage the clutch. Forward rotation of the centre disc will cause the **left-hand** rim to move **outwards**.

Conversely, relocate the **lower left-hand** stop and the **upper right-hand** stop. Select a low **reverse** gear, apply the **right-hand** footbrake, release the hand-brake and engage the clutch to move the **left-hand** rim **inwards**.

Re-locate the remaining stops against the other side of the clamps. Tighten all clamp nuts uniformly, half a turn at a time, until a torque of 245 Nm (180 lbf.ft) is obtained. 'Seat' the clamps using a hammer and hardwood block then re-torque the nuts to 245 Nm (180 lbf.ft).



159

IMPORTANT: *Visually check the gap (2) Figure 159, between each clamp (1) and the wheel disc (3). The gap should not vary by more than 0.125 in. (3 mm) between any of the clamps otherwise the rim and tyre will not run true and excessive side loads will be imposed on one or more of the rails.*

Power Adjusting a Right-hand Wheel

Position the right-hand wheel with a pair of stops at the top. Loosen the nuts on all the clamp attaching bolts.

If an **increase** in track width is required, remove the stop to the **right** of the **lower** clamp and to the **left** of the **upper** clamp. Relocate both clamps in the appropriate holes in the rail.

With the engine running, select a low **reverse** gear, apply the **left-hand** footbrake, release the handbrake and engage the clutch. Rearward rotation of the centre disc will cause the **right-hand** rim to move **outwards**.

Conversely, relocate the **lower left-hand** stop and the **upper right-hand** stop. Select a low **forward** gear, apply the **left-hand** footbrake, release the handbrake and engage the clutch to move the **right-hand** rim **inwards**.

Tighten the stop screws to 45 Nm (33 lbf.ft.).

Re-locate the remaining stops against the other side of the clamps. Tighten all the clamp nuts uniformly and recheck at the appropriate intervals, as previously described for the left-hand wheel.

Drive the tractor for approximately 200 m (200 yards) and check the clamp nut torques. Recheck the torque settings after 1 hour and 8 hours operation and thereafter at the 50 hour service interval.

NOTE: *Use a forward gear to move the left-hand rim outwards or the right-hand rim inwards. Conversely, a reverse gear is used to move the left-hand rim inwards or the right-hand rim outwards.*

Changing Rear Wheel Track Width Range

To change from one track width range to another, it is necessary to remove the rear wheels and reposition them on the other side of the tractor. This will provide an alternative, wider range of track settings, as shown in the table on page 3-87.

CAUTION

Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot topple and cause injury.

Block the front wheels and jack up and support the rear axle. Remove the disc to hub nuts. Using a suitable lifting device, remove the wheel and store the wheel and tyre where it won't fall over. Repeating the procedure, remove the opposite wheel and install it on the hub from which the first wheel was removed.

IMPORTANT: *When interchanging left and right-hand wheel assemblies, ensure the "V" at the top of the tyre tread remains pointing in the direction of forward travel.*

Tighten the rear disc to hub nuts uniformly, half a turn at a time, until a torque of 250 Nm (184 lbf.ft) is obtained.

NOTE: *Check nut torque after driving the tractor for 200 m (200 yards), after 1 hour and 10 hours of operation and thereafter at the 50-hour service intervals.*

WARNING

Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

After swapping the rear wheels over, power adjust, as previous described, to obtain the required track setting.

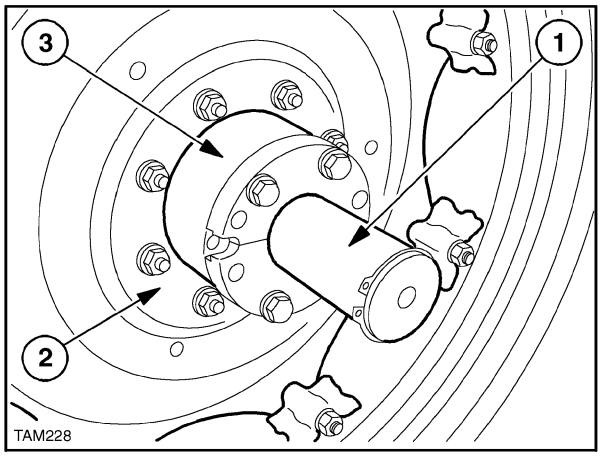
BAR AXLE (where fitted)

⚠ CAUTION ⚠

Your tractor is produced with lights that meet lighting regulations when operating or travelling on the public highway. If the wheel track setting is adjusted beyond the initial factory position then you may be required to reposition the lights or fit auxiliary lighting to comply with legal requirements. Additionally, before travel-ling on the highway, ensure that the overall tractor width does not exceed the maximum permitted in your country.

INTRODUCTION - Figure 160

All models equipped with a bar axle have manual adjust wheels. The wheels have a steel centre disc (2) Figure 160 mounted on a cast iron hub (3). The hub is clamped to the bar axle (1). Wheels with a cast iron centre disc are also available. With this type of wheel, the hub is an integral part of the centre disc.



160

Two bar axle lengths are available - 2490 mm (98 in.) and 2845 mm (112 in.). After unclamping the hub, the wheel may be moved along the bar to provide a range of track widths. A range of 190 mm (7.5 in.) per wheel or 380 mm (15 in.) overall is available with the 98 inch axle. If the 112 inch axle is installed, the range is increased to 735 mm (29 in.) overall. The 112 inch axle may also be used to mount dual wheels.

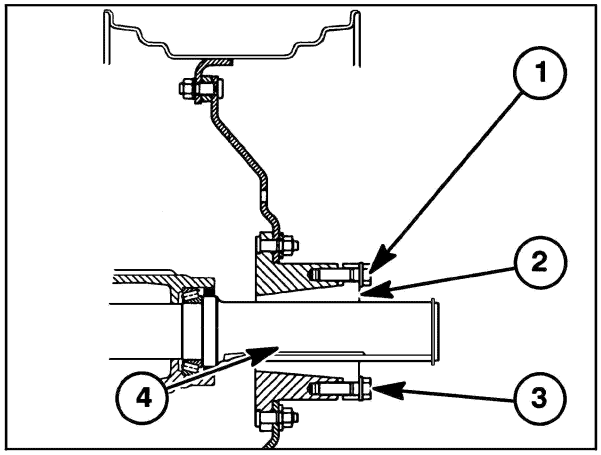
Track width adjustment is effected by moving the complete wheel/hub assemblies in or out on the axle shaft. Moving the wheel inwards (toward the tractor) will reduce track width. Moving the wheel outwards will increase track width. Additionally, repositioning the wheel rim on the centre disc and/or the rim on the axle hub or by inter-changing the rear wheels provides a greater range of adjustment.

Tractor wheels are very heavy so it is recommended that you do not remove them to reposition the rims on the disc unless the track setting required is outside the slide range of the bar axle.

MOVING A WHEEL ON THE AXLE SHAFT - Figures 161 to 163

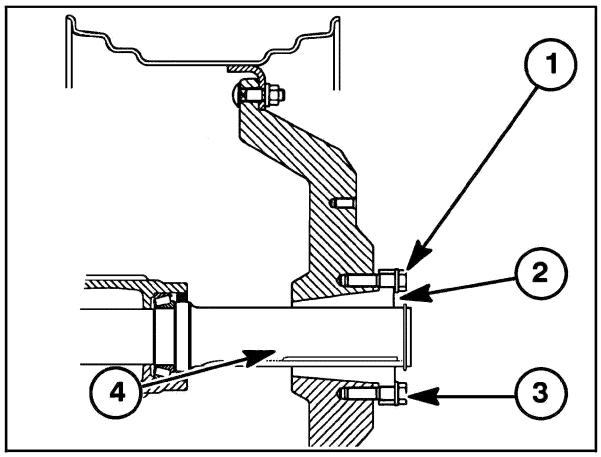
The method of moving a wheel along the bar axle is the same for all wheels whether they have steel or cast iron discs. Steel wheels are bolted to a cast iron, hub that clamps onto the bar axle. Cast wheel have the hub incorporated as part of the assembly.

Apply the parking brake and block the front wheels to prevent movement. Jack up and support the rear axle so that the wheels are only just clear of the ground.



161

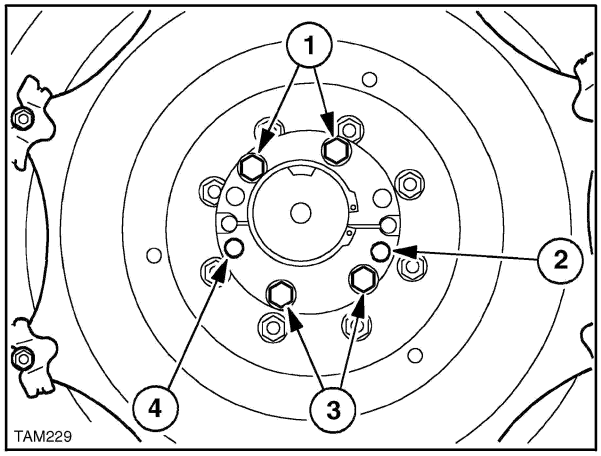
Figure 161 shows a cross-section through the wheel/ axle assembly with a steel disc wheel. A sectioned view of the cast iron disc wheel is shown in Figure 162. The outer section of the hub (2) is split into two parts (collet). There are two bolts in in each half of the collet (only one bolt can be seen in the sectioned drawings). The action of tightening the bolts (1) and (3) will pull the collet into the tapered hub, clamping the collet onto the axle shaft (4).



162

To move a wheel on the axle shaft it is necessary to unclamp the hub from the shaft.

With reference to Figure 163, loosen the two screws (1), five or six turns. Unscrew and remove the two bolts (3) from the lower section of the collet. Remove the two plastic thread protectors from the threaded holes (2) and (4). The removed bolts and the threaded holes in the collet should be cleaned and lubricated. Insert the two screws removed from the lower section and insert them into the threaded holes. These screws are used to 'jack' the lower half of the split collet away from the inner hub to unclamp the assembly from the axle shaft. When the hub becomes free, stop turning the jack bolts.



163

Remove the two jack bolts from the threaded holes and screw them loosely into their original holes in the lower section of the collet. Slide the complete wheel and hub assembly along the axle shaft to the required position. Tighten all four collet bolts (1) and (3) half a turn at a time until a final torque of 300 Nm (220 lbf. ft.) is reached.

Repeat the procedure on the other wheel, making sure that both wheels are the same distance from the outer ends of the axle shaft.

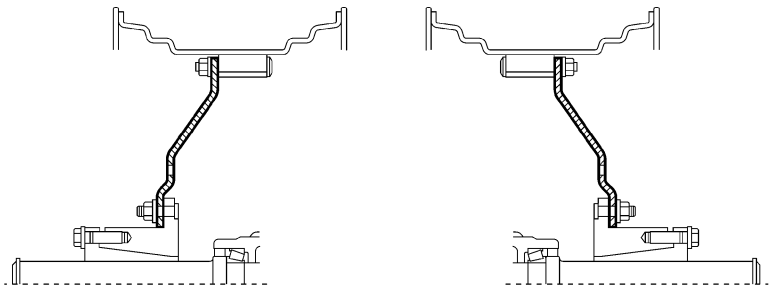
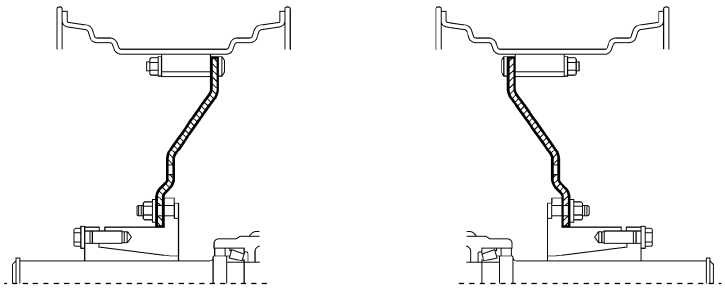
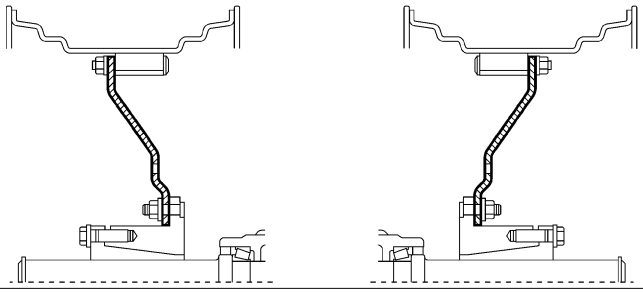
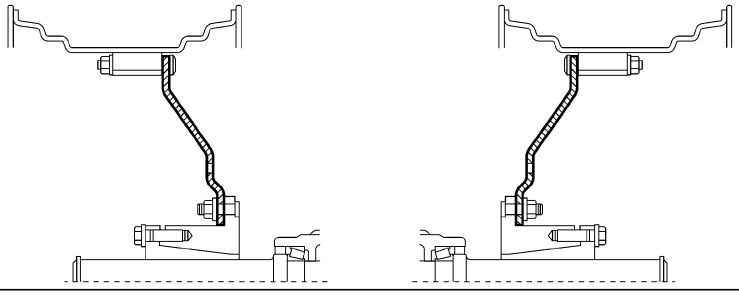
NOTE: *After driving the tractor for 200 m (200 yards), check the torque of all* ***four*** *collet bolts (1) and (3) Figure 163, on both wheels. Recheck the torques after 1 hour and 10 hours of operation and thereafter at the 50-hour service intervals.*

⚠ WARNING ⚠

Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

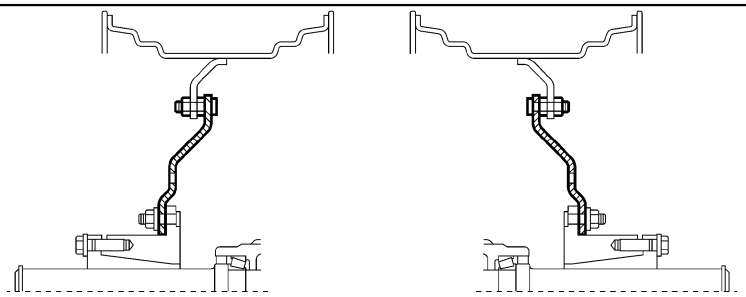
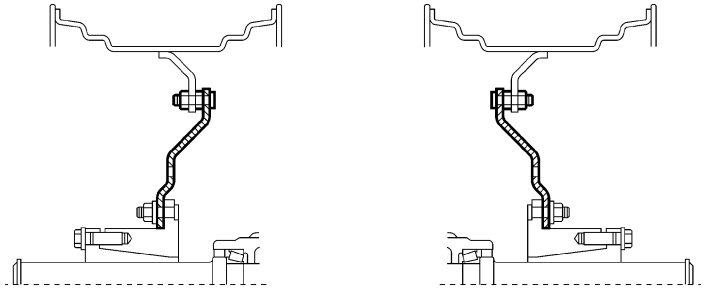
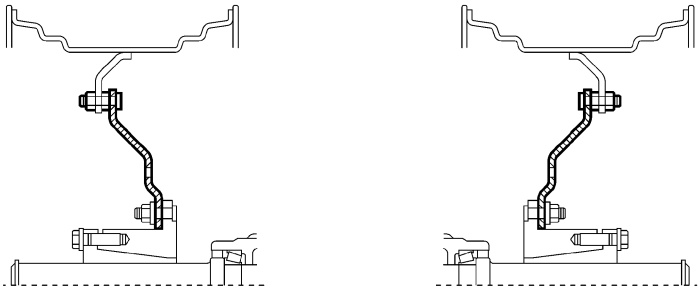
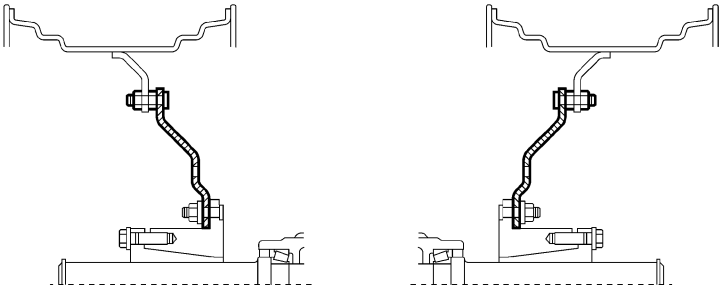
WHEEL ADJUSTMENT - Figures 164 to 166

The sectioned drawings shown in Figures 164, 165 and 166 illustrate the wheel rim and disc positions at various track settings.

2490 mm (98 in.) axle	2845 mm (112 in.) axle	Rim/disc position
1566 - 1946 mm (61.7 - 76.6 in.)	1921 - 2301 mm (75.6 - 90.6 in.)	
1768 - 2148 mm (69.6 - 84.6 in.)	2123 - 2503 mm (83.6 - 98.5 in.)	
1966 - 2346 mm (77.4 - 92.4 in.)	2321 - 2701 mm (91.4 - 106.3 in.)	
2168 - 2548 mm (85.3 - 100.3 in.)	2523 - 2903 mm (99.3 - 114.3 in.)	

SMM284

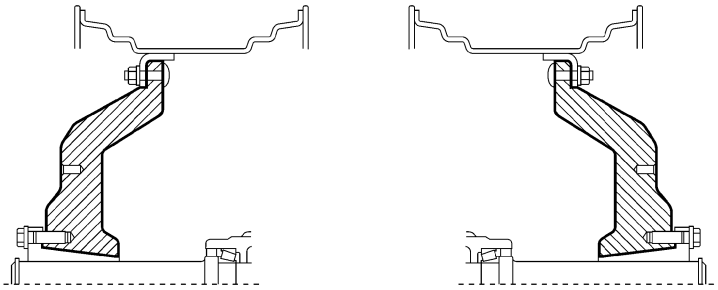
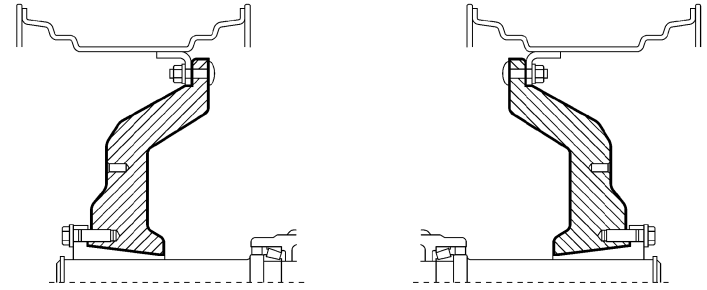
164 Wheels with steel centre disc bolted to eight lugs welded to the rim

2490 mm (98 in.) axle	2845 mm (112 in.) axle	Rim/disc position
1548 – 1928 mm (60.9 – 75.9 in.)	1903 – 2283 mm (74.9 – 89.9 in.)	
1772 – 2152 mm (69.8 – 84.7 in.)	2127 – 2507 mm (83.7 – 98.7 in.)	
1970 – 2350 mm (77.6 – 92.5 in.)	2325 – 2705 mm (91.5 – 106.5 in.)	
2174 – 2554 mm (85.6 – 100.6 in.)	2529 – 2909 mm (99.6 – 114.5 in.)	
SMM285		

165 Wheels with round steel centre disc bolted to flange on the rim

In each table, two track width settings are quoted for each axle type. These are the minimum and maximum achievable with both wheel assemblies moved fully in (toward the tractor) and fully out (away from the tractor).

NOTE: *With the larger width tyres, it may not be possible to move the wheels to the narrower settings due to limited clearance between the tyre and fender.*

2490 mm (98 in.) axle	2845 mm (112 in.) axle	Rim/disc position
1466 – 1846 mm (57.7 – 72.7 in.)	1821 – 2201 mm (71.7 – 86.7 in.)	
1846 – 2226 mm (72.7 – 87.6 in.)	2201 – 2581 mm (86.7 – 101.6 in.)	

166 Wheels with cast centre disc

IMPORTANT: *When interchanging left and right-hand wheel assemblies, ensure the "V" at the top of the tyre tread remains pointing in the direction of forward travel.*

⚠ CAUTION ⚠

Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot topple and cause injury.

⚠ WARNING ⚠

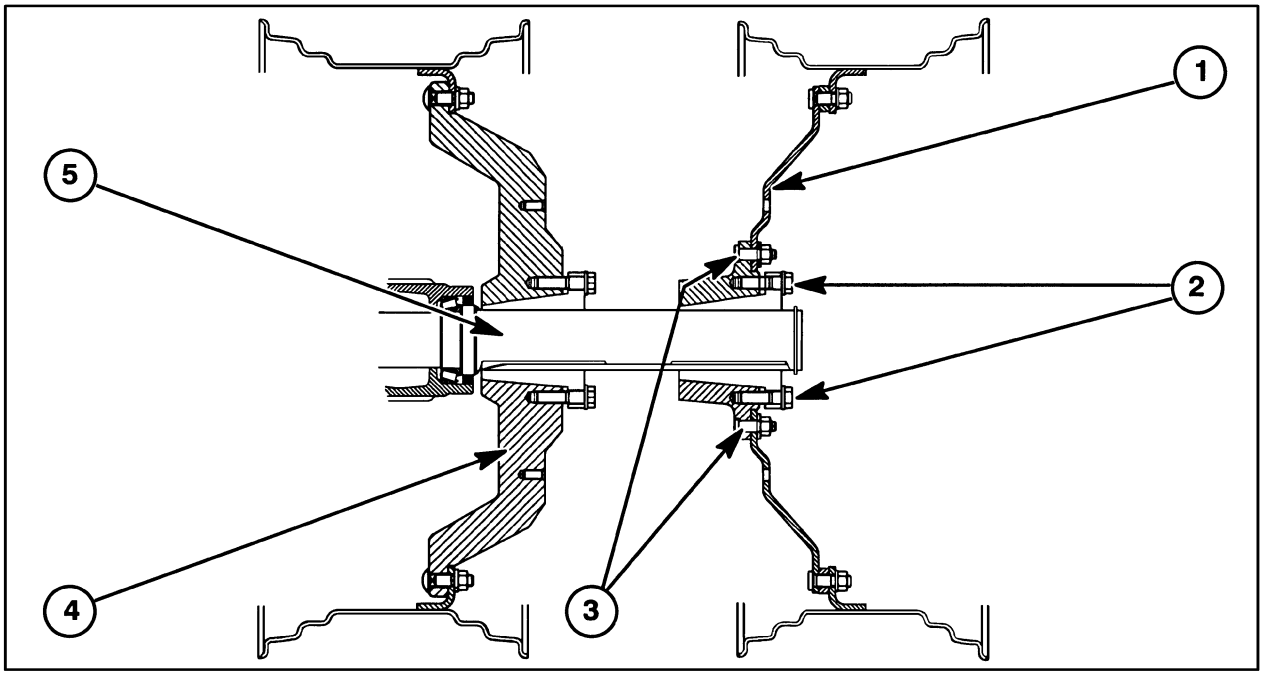
Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

When refitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor for 200 m (200 yards), after 1 hour and 8 hours operation and thereafter at the 50 hour service intervals:

Disc to hub nuts
Steel disc wheels only 260 Nm (190 lbf. ft.)

Disc to rim nuts
Cast disc wheels 450 Nm (330 lbf. ft.)

Disc to rim nuts
Steel disc wheels
M16 nuts 225 Nm (166 lbf. ft.)
M18 nuts with 125 mm bolts 360 Nm (266 lbf. ft.)
M18 nuts with 65 mm bolts 450 Nm (330 lbf. ft.)



167

DUAL REAR WHEELS (where fitted) – Figures 167 and 168

Dual rear wheels are available as a factory installed option or dealer installed accessory, in conjunction with the 2845 mm (112 in.) bar axle equipped with cast iron or steel wheels. The dual wheel kit consists of an additional pair of steel wheels, hubs and wheel-to-hub attaching hardware.

Customers may wish to mount their existing wheels to make a dual wheel installation. In this instance, provided that the existing wheels have the same mounting dimensions, they will only need to obtain the hub assembly. The hub assembly has eight, equi-spaced M18 mounting studs (4) Figure 167, in a pitch circle diameter of 275 mm.

IMPORTANT: *Dual wheels are intended for flotation. Use of dual wheels under* ***heavy traction conditions*** *could cause severe transmission overload and is not approved.*

Before the outer wheels can be installed, the inner wheels must be adjusted to the minimum attainable track width, as described in the previous text.

Figure 167 shows a typical wheel installation. The inner (cast) wheel (4) is clamped onto the bar axle (5). The outer (steel) wheel (1) is attached to the hub by eight bolts (3). The hub is clamped to the bar axle by the four bolts (2) in a similar manner to the cast, inner wheel.

When mounting wheels, the clearance between the tyres on the inner wheels and the closest part of the tractor must be no less than 100 mm (4 in.).

Additionally, a minimum clearance of 100 mm (4 in.) must be maintained between the closest points of the tyre walls, see Figure 168. The clearance should be checked with the tractor correctly ballasted and the attached implement in the raised position.

To move a wheel on the axle shaft it is necessary to unclamp the hub from the shaft.

Block the front wheels and jack up and support the rear axle.

With reference to Figure 169, loosen the two screws (1), five or six turns. Unscrew and remove the two bolts (3) from the lower section of the collet. Remove the two plastic thread protectors from the threaded holes (2) and (4).

The removed bolts and the threaded holes in the collet should be cleaned and lubricated. Insert the two screws removed from the lower section and insert them into the threaded holes. These screws are used to 'jack' the lower half of the split collet away from the inner hub to unclamp the assembly from the axle shaft. When the hub becomes free, stop turning the jack bolts.

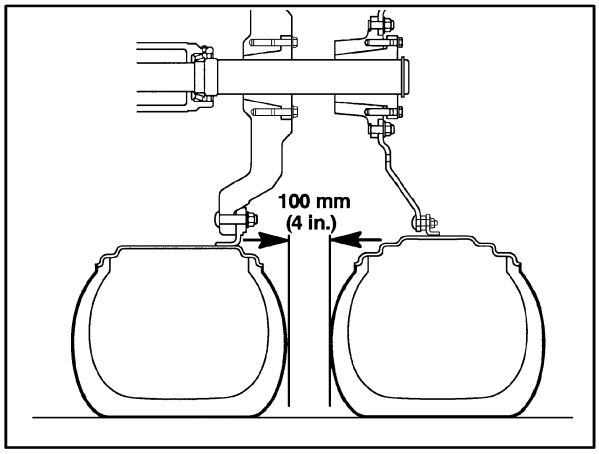
Remove the two jack bolts from the threaded holes and screw them loosely into their original holes in the lower section of the collet. Slide the complete wheel and hub assembly along the axle shaft to the required position. Tighten all four collet bolts (1) and (3) half a turn at a time until a final torque of 300 Nm (220 lbf. ft.) is reached.

Repeat the procedure on the other wheel, making sure that both wheels are the same distance from the outer ends of the axle shaft.

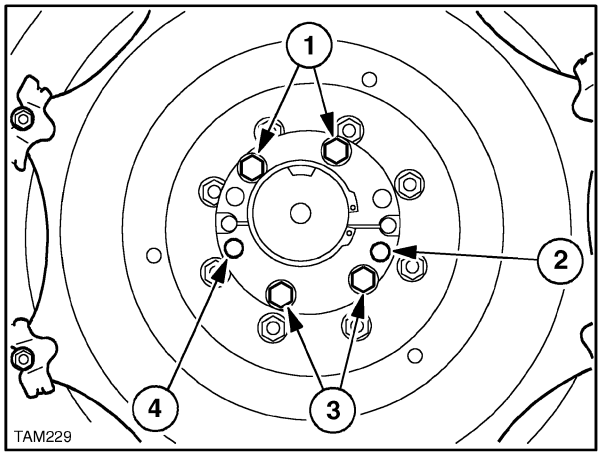
NOTE: *After driving the tractor for 200 m (200 yards), check the torque of all* ***four*** *collet bolts (1) and (3) Figure 169, on both wheels. Recheck the torques after 1 hour and 10 hours of operation and thereafter at the 50-hour service intervals.*

⚠ WARNING ⚠

Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals. Specified torques are as follows:



168



169

Disc to hub nuts
Steel discs only 260 Nm (190 lbf. ft.)

Disc to rim nuts
Cast discs 450 Nm (330 lbf. ft.)

Disc to rim nuts
Steel discs

M16 nuts	225 Nm (166 lbf. ft.)
M18 nuts with 125 mm bolts	360 Nm (266 lbf. ft.)
M18 nuts with 65 mm bolts	450 Nm (330 lbf. ft.)

BALLASTING AND TYRES

GENERAL

Maximum tractor performance is dependent upon proper ballasting and tyre selection. Maximum efficiency will be achieved when tractor weight is correct for the application.

The tyres selected for your tractor must be able to support the weight of the tractor and equipment and must also be able to provide adequate traction to utilize the tractor horsepower and turn it into useful drawbar horsepower.

Always maintain the correct air pressure in the tyre to carry the load. Do not over inflate tyres.

NOTE: *Radial tyres will work with lower air pressures and will show up to 20% sidewall deflection or bulge when correctly inflated.*

Factors Affecting Tyre Performance

- Correct air pressure for the load
- Correct wheel slip
- Correct tyre size for expected load
- Correct fill of liquid ballast
- Maintaining equal tyre pressure in both tyres on a given axle.

Selecting Ballast

When tractor horsepower loads vary, the optimum weight of the tractor will change. This means that ballast may have to be added or removed to maintain the best tractor performance. Proper ballast will greatly improve tractor operation and ride.

The amount of ballast required is affected by:

- Weight of tractor
- Soil and traction conditions
- Type of implement: fully-mounted, semi- mounted or trailed
- Working speed
- Tractor horsepower load
- Type and size of tyres
- Tyre pressures

Do not use more ballast than needed. Excess ballast should be removed when it is not required.

Too little ballast:
- Rough ride
- Excessive wheel slip
- Power loss
- Tyre wear
- Excessive fuel consumption
- Lower productivity

Too much ballast:
- Higher maintenance costs
- Increased driveline wear
- Power loss
- Increased soil compaction
- Excessive fuel consumption
- Lower productivity

For maximum performance in heavy draft conditions weight should be added to the tractor in the form of liquid ballast, cast iron weights or a combination of both.

Front end ballast may be required for stability and steering control when weight is transferred from the front to the rear wheels as rear mounted implement is raised by the tractor 3-point linkage.

When a rear mounted implement is raised to the transport position, the weight on the front wheels should be at least 20% of total tractor weight.

CAUTION

Additional front ballast may be needed when transporting large 3-point mounted equipment. Always drive slowly over rough terrain, no matter how much front ballast is used.

For optimum performance and efficiency, two wheel drive tractors should be ballasted so that approximately one third of the total tractor weight (less implement) is on the front wheels. Four wheel drive tractors should be ballasted so the weight on the front wheels is approximately 40 - 45% of the total tractor weight.

Add additional front end ballast, as required, for stability during operation and transport. Ballasting of the front end may not always provide adequate stability if the tractor is operated at high speed on rough terrain. Reduce tractor speed and exercise caution under these conditions.

When using front mounted implements it may be necessary to add weight to the rear wheels to maintain traction and stability.

Ballast Limitations

Ballast should be limited by the tyre capacity or tractor capacity. Each tyre has a recommended carrying capacity which should not be exceeded, (see page 3-104).

If a greater amount of weight is needed for traction, larger tyres should be used.

Ballast can be added by bolting on cast iron weights or by adding liquid calcium chloride in the tyres. Bolt-on cast iron weights are recommended because they can easily be removed when not needed.

IMPORTANT: *Do not exceed the tractor gross vehicle weight shown below. This can cause an overload condition that may invalidate the warranty and may exceed the load rating of the tyres. The maximum recommended gross vehicle weight is the weight of the tractor plus ballast plus any mounted equipment such as sprayers, tanks etc. in the raised position. See the following table:*

Models	Maximum Gross Vehicle Weight kg	lb
TM115	8500	18743
TM125	8500	18743
TM135	9000	19845
TM150	10000	22050
TM165	10500	23153

IMPORTANT: *Braking regulations in some countries may impose lower gross vehicle weight limits for road transport than the figures quoted in the above table.*

Individual axles (front and rear) are also subject to weight limitations, as follows:

Maximum Front Axle Loading - 2WD#		
Models	**kg**	**lb**
All Models	3500	7718

Includes a front end loader in the raised position but with no load in the bucket.

Maximum Front Axle Loading - 4WD# (Continuous Operation)		
Models	**kg**	**lb**
TM115	3800	8379
TM125	3800	8379
TM135	3800	8379
TM150	4500	9920
TM165	4500	9920

Includes a front end loader in the raised position but with no load in the bucket.

IMPORTANT: *For four wheel drive vehicles, the figures shown in the foregoing table are for continuous operation. For intermittent operation, the front axle loading (including loaded loader bucket) may be increased to the following levels, provided that ground speed does not exceed 8 km/h (5 MPH) and the track width settings are maintained within the limits shown:*

Maximum Front Axle Loading - 4WD (Restricted Operation)				
			Track Setting	
Models	**kg**	**lb**	**mm**	**in**
TM115	6000	13228	1625 - 1930	64 - 76
TM125	6000	13228	1625 - 1930	64 - 76
TM135	6000	13228	1625 - 1930	64 - 76
TM150	7000	15432	1727 - 2032	68 - 80
TM165	7000	15432	1727 - 2032	68 - 80

Models	Maximum Rear Axle Loading kg	lb
TM115	6500	14330
TM125	6500	14330
TM135	7500	16535
TM150	7500	16535
TM165	8000	17637

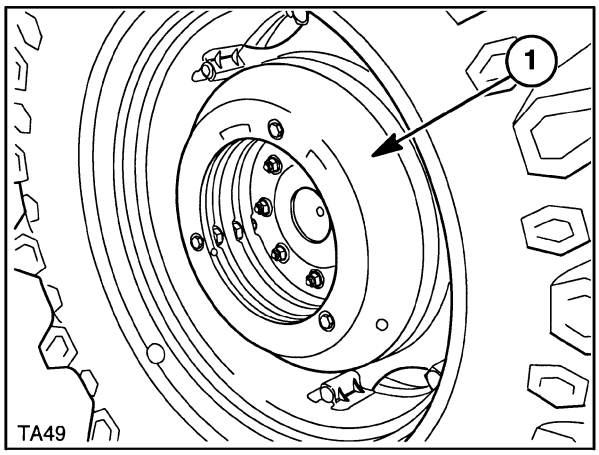
NOTE: *Total rear axle weight is measured with only the rear wheels on the scales inclusive of liquid and cast iron ballast and with mounted equipment in the raised position.*

CAST IRON WEIGHTS (where fitted)

Rear Wheel Weights - Figure 170

Up to three cast iron weights (1) may be added to each rear wheel, as follows:

Models	Max. Weight per Wheel	Total Weight per Axle
TM115 TM125	3 x 50 kg 3 x 110 lb	300 kg 660 lb
TM135 TM150 TM165	3 x 65 kg 3 x 143 lb	390 kg 858 lb



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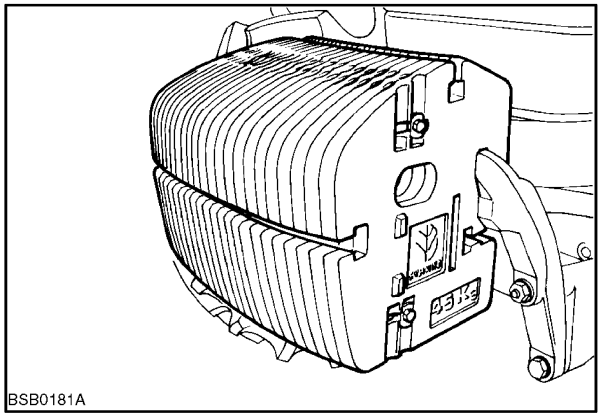
Front end wafer weights weighing 45 kg (99 lb.) are available in sets as described in the following text.

Front Weights - Figure 171

45 kg (99 lb.) wafer weights are available as a set of 10 or as a set of 22, mounted on a substantial cast iron carrier.

The maximum recommended front ballast weight is as follows:

Front Axle Type	Weight Pack	Carrier	Total Weight
All 2WD	10 x 45 kg 10 x 99 lb	90 kg 198 lb.	540 kg 1190 lb
All 4WD (except Supersteer)	22 x 45 kg 22 x 99 lb	90 kg 198 lb	1080 kg 2381 lb
Supersteer	22 x 45 kg 22 x 99 lb	138 kg 304 lb	1128 kg 2487 lb



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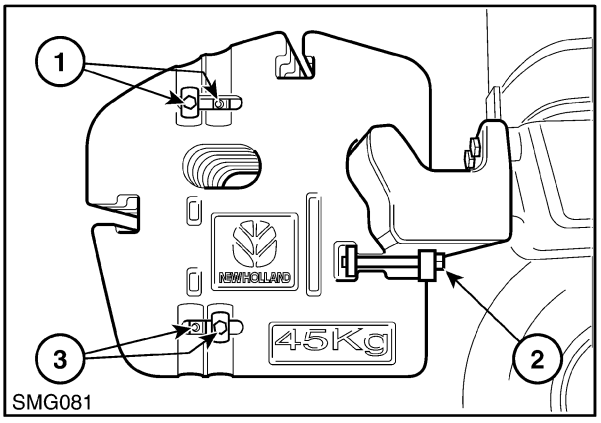
Front tow hook adds 8.5 kg to the total weight

IMPORTANT: *The set of 22 weights should not be installed on two wheel drive tractors as the tyre capacity will be exceeded.*

Figure 172
The weights are clamped together by means of the long through bolts (1) and (3) and secured to the carrier by the clamp bolts (2).

The weights may be removed as a complete set with the aid of suitable lifting gear. Loosen the clamp bolts (2) and slide the clamp assembly sideways out of the weight pack. With a lifting bar passed through the central hole in the weights, the complete weight set may now be lifted off the carrier.

Alternatively, the weights can be removed individually after loosening the clamp bolts and removing all four through bolts (1) and (3).

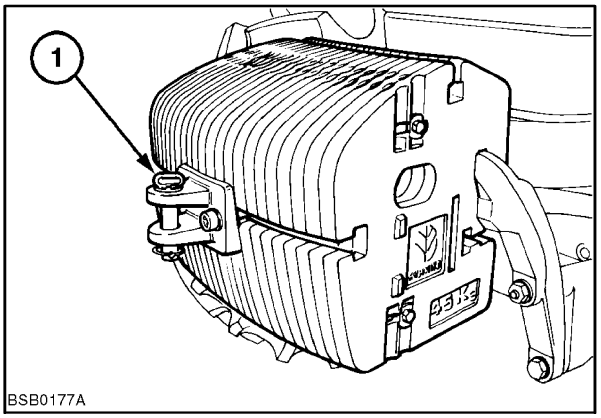


172

⚠ CAUTION ⚠

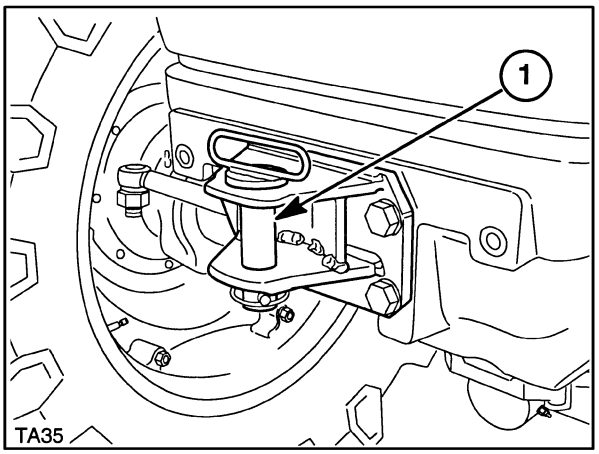
The tractor must not be operated unless all four through bolts and the clamp bolts are in position with the bolts tightened to 125 lbf.ft. (169 Nm). Recheck the bolt torques after 50 hours of operation if the bolts have been disturbed for any reason.

Figure 173
A towing facility is built into the weight carrier. However, if the weights are installed a tow pin (1) is available that clamps onto the front of the weight pack.



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Figure 174
If front weights are not required, a tow pin (1) is available for bolting directly to the front axle support.



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LIQUID BALLAST

Filling the front and rear tyres with liquid ballast is a convenient method of adding weight. A solution of calcium chloride and water is recommended. This gives a low freezing point and provides a higher density than plain water.

IMPORTANT: *In some countries it is illegal to use calcium chloride as a ballast solution for tyres. Ensure that you comply with the legal requirements of your country. Use cast iron weights as an alternative to liquid ballast.*

NOTE: *When filling a tyre with calcium chloride/water solution the valve should be at the highest point on the wheel. The valve should be at the lowest point when checking or adjusting air pressure if the tyre contains liquid ballast. Special equipment is required to water ballast tyres. See your authorised dealer or tyre supplier for details.*

The table on the right shows the quantity of calcium chloride and water required for each tyre size option and is based on 0.6 kg of calcium chloride per litre of water. The figures in the table will give a 75% fill of the tyre. This calcium chloride/water solution will give protection from freezing down to an ambient temperature of -50°C (-58°F).

NOTE: *Liquid ballasting of front tyres on a 2wd installation is not recommended.*

⚠ WARNING ⚠

When mixing the ballast solution it is imperative the calcium chloride flakes are added to the water and the solution stirred until the calcium chloride is dissolved.

Never add water to calcium chloride as considerable heat is generated. If the flakes should contact the eyes, wash the eyes immediately with clean, ***cold*** *water for at least 5 minutes. Consult a doctor as soon as possible.*

Tyre Size	Water Litres	Calcium Chloride kg	Total weight of solution per tyre kg
Front tyres			
14.9 - 24	134	80	214
13.6 - 28	119	71	190
14.9 - 28	148	89	237
16.9 - 28	205	123	328
380/70R - 28	129	77	206
420/70R - 28	167	100	267
480/65R - 28	180	108	288
480/70R - 28	224	134	358
540/65R - 28	253	152	405
14.9 - 30	156	94	250
Rear tyres			
18.4 - 34	293	176	469
16.9 - 38	257	154	411
18.4 - 38	317	190	507
20.8 - 38	413	248	661
480/70R - 38	273	164	437
520/70R - 38	336	201	537
580/70R - 38	437	262	699
600/65R - 38	385	231	616
650/65R - 38	475	285	760
18.4 - 42	353	212	564
14.9 - 46	246	147	393
12.4 - 54	136	98	260
390/90R - 54	136	98	260

Tyre Size	Water US Gallons	Calcium Chloride lb	Total weight of solution per tyre lb
Front tyres			
14.9 - 24	38	190	507
13.6 - 28	35	175	467
14.9 - 28	43	215	574
16.9 - 28	56	280	747
380/70R - 28	34.2	170	455
420/70R - 28	44.4	220	590
480/65R - 28	50	250	667
480/70R - 28	59	295	788
540/65R - 28	64	320	854
14.9 - 30	46	230	614
Rear tyres			
18.4 - 34	81	405	1081
16.9 - 38	73	365	974
18.4 - 38	89	445	1187
20.8 - 38	114	570	1521
480/70R - 38	72	362	962
520/70R - 38	89	443	1183
580/70R - 38	115	578	1538
600/65R - 38	104	520	1387
650/65R - 38	130	650	1734
18.4 - 42	93	465	1240
14.9 - 46	65	325	867
12.4 - 54	47	235	627
320/90R - 54	47	235	627

TYRE INFLATION

Upon receiving your tractor, check the air pressure in the tyres and recheck every 50 hours or weekly. The tyres fitted to your tractor may be of the tubed or tubeless type.

When checking tyre pressures, inspect the tyres for damaged tread and side walls. Neglected damage will lead to early tyre failure.

Inflation pressure affects the amount of weight that a tyre may carry.

Locate the tyre size for your tractor in the Tyre Pressure and Load tables on the page 3-104. Do not exceed the load for the pressures listed. Do not over or under inflate the tyres.

DANGER

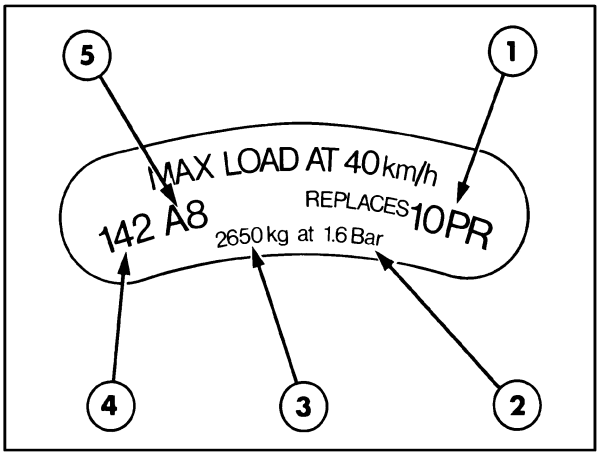
Inflating or servicing tyres can be dangerous. Whenever possible, trained personnel should be called in to service or install tyres. In any event, to avoid the possibility of serious or fatal injury, follow the safety precautions below:

- *Never attempt tyre repairs on a public road or highway.*
- *Do not inflate steering tyres above the manufacturer's maximum pressure shown on the tyre or beyond the maximum shown in the Tyre Pressure and Load tables if the tyre is not marked with the maximum pressure.*
- *Do not re-inflate a tyre that has been run flat or seriously under-inflated until it has been inspected for damage by a qualified person.*
- *Torque wheel to axle nuts to specification after re-installing the wheel. Check nut tightness daily until torque stabilises.*
- *Refer to tractor weighting section before adding ballast to the tyres.*
- *Ensure the jack is placed on a firm, level surface.*
- *Ensure the jack has adequate capacity to lift your tractor.*
- *Use jack stands or other suitable blocking to support the tractor while repairing tyres.*
- *Do not put any part of your body under the tractor or start the engine while the tractor is on the jack.*
- *Never hit a tyre or rim with a hammer.*
- *Ensure the rim is clean and free of rust or damage. Do not weld, braze, otherwise repair or use a damaged rim.*
- *Do not inflate a tyre unless the rim is mounted on the tractor or is secured so that it will not move if the tyre or rim should suddenly fail.*
- *When fitting a new or repaired tyre, use a clip-on valve adaptor with a remote gauge that allows the operator to stand clear of the tyre while inflating it. Use a safety cage, if available.*

TYRE PRESSURES AND PERMISSIBLE LOADS (Radial tyres)

Radial tyre performance is now denoted by a Load Index and Speed Symbol replacing the Ply Rating commonly found on cross ply tyres. Figure 175 shows typical markings to be found on the side wall of radial ply tyres.

NOTE: *All radial tyres have a speed symbol 'A8' and are therefore suitable for speeds up to 40km/h (25 MPH).*



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1. Old ply rating mark
2. Maximum inflation pressure (in bar)
3. Maximum load at 40 km/h (25 MPH)
4. Load Index
5. Speed Symbol

The maximum load that may be carried by the tyre is dependent upon the Load Index shown on the side wall. In the following charts the loads given are for individual tyres operated at speeds up to 30 km/h (19 MPH). The right-hand (shaded) column indicates the maximum load at speeds up to 40 km/h (25 MPH).

Load Index	Inflation Pressure - bar									
	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6
	Load Capacity per TYRE - kg									
107	680	725	770	815	860	910	955	1000	1050	975
109	720	765	815	860	910	960	1005	1055	1100	1030
114	830	885	940	990	1050	1100	1155	1210	1260	1180
116	885	940	995	1055	1115	1170	1225	1280	1340	1250
119	965	1020	1090	1145	1210	1270	1335	1390	1455	1360
121	1020	1080	1150	1220	1285	1355	1420	1485	1555	1450
122	1045	1120	1185	1265	1330	1400	1465	1535	1605	1500
123	1070	1145	1220	1295	1365	1430	1515	1585	1660	1550
124	1105	1180	1260	1335	1410	1490	1565	1640	1715	1600
126	1170	1250	1335	1415	1495	1580	1660	1740	1820	1700
127	1200	1285	1370	1450	1535	1620	1710	1780	1875	1750
128	1230	1320	1410	1495	1580	1670	1755	1840	1926	1800
134	1445	1550	1655	1760	1855	1965	2065	2165	2270	2120
135	1510	1615	1720	1825	1920	2030	2130	2230	2335	2180
136	1550	1660	1765	1875	1875	2080	2185	2290	2395	2240
137	1605	1710	1820	1925	2035	2140	2245	2350	2460	2300
139	1715	1825	1935	2050	2155	2270	2380	2495	2600	2430
141	1820	1935	2055	2170	2290	2410	2520	2640	2760	2575
142	1875	1990	2115	2230	2355	2480	2595	2710	2836	2650
144	1980	2110	2240	2360	2490	2615	2745	2975	3000	2800
146	2085	2225	2370	2510	2650	2790	2930	3070	3210	3000
153	2525	2700	2875	3045	3215	3390	3565	3755	3905	3650
155	2675	2865	3045	3225	3415	3595	3780	3960	4150	3875
157	2835	3035	3235	3430	3630	3825	4020	4260	4415	4125
159	3000	3210	3420	3635	3845	4060	4260	4475	4685	4375
166	3695	3945	4190	4435	4685	4935	5180	5425	5675	5300

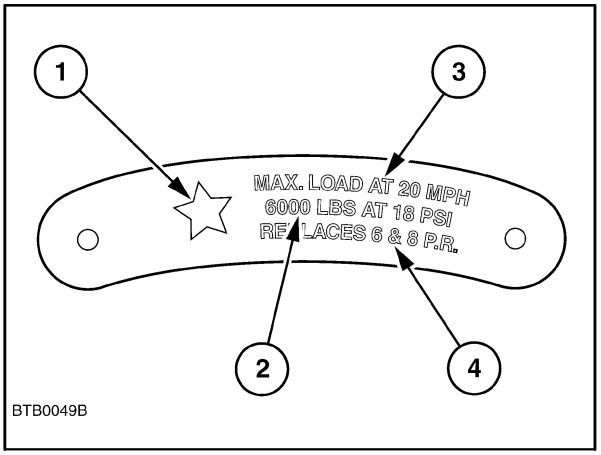
Load Index	Inflation Pressure - lbf/in²									
	12	13	15	16	17	18	20	22	23	23
	Load Capacity per TYRE - lb									
107	1500	1600	1695	1795	1895	2005	2105	2205	2315	2150
109	1585	1685	1795	1895	2005	2115	2215	2325	2430	2270
114	1830	1950	2070	2180	2315	2425	2545	2665	2780	2600
116	1950	2070	2195	2325	2460	2580	2700	2820	2955	2755
119	2125	2250	2405	2525	2665	2800	2945	3065	3205	3000
121	2250	2380	2535	2690	2830	2985	3130	3275	3430	3195
122	2305	2470	2610	2790	2930	3085	3230	3385	3540	3305
123	2360	2525	2690	2855	3010	3150	3340	3495	4135	3860
124	2435	2600	2775	2945	3110	3285	3450	3615	3780	3525
126	2580	2755	2945	3120	3295	3485	3660	3835	4010	3745
127	2645	2830	3020	3195	3385	3570	3770	3925	4135	3860
128	2710	2910	3110	3295	3485	3680	3870	4055	4245	3970
134	3185	3415	3650	3880	4090	4330	4550	4770	5005	4675
135	3330	3560	3790	4025	4230	4475	4695	4915	5145	4805
136	3415	3660	3890	4135	4355	4585	4815	5050	5280	4940
137	3538	3770	4010	4245	4485	4715	4950	5180	5425	5070
139	3780	4025	4265	4520	4750	5005	5245	5500	5730	5355
141	4010	4265	4530	4785	5050	5315	5555	5820	6085	5675
142	4133	4385	4660	4915	5190	5465	5720	5975	6250	5840
144	4365	4650	4940	5200	5490	5765	6050	6560	6615	6170
146	4595	4905	5225	5535	5840	6150	6460	6770	7075	6615
153	5565	5950	6340	6715	7085	7475	7860	8280	8610	8045
155	5895	6315	6715	7110	7530	7925	8335	8730	9150	8540
157	6250	6690	7130	7560	8000	8430	8860	9390	9735	9095
159	6615	7075	7535	8015	8475	8950	9390	9865	10330	9645
166	8145	8695	9235	9775	10330	10880	11420	11960	12510	11685

The above table is for guidance only. For exact information regarding inflation pressures and loads for your particular tyres, consult your authorised dealer.

SYMBOL MARKED RADIAL TYRES NORTH AMERICA ONLY

Conventional sized radial agricultural tractor drive tyres are marked with *, **,or *** symbols. The maximum load rating for tyres marked with a * is calculated at 18 psi inflation pressure. Tyres marked with ** or *** have maximum load carrying capacities at pressures of 24 psi and 30 psi respectively.

For information regarding specific inflation pressures and load carrying capacities for the tyres fitted to your tractor, consult your authorised dealer.



1. Load symbol
2. Maximum recommended load at marked pressure
3. Maximum load at 20 MPH
4. Previous ply ratings

NOTES

SECTION 4
LUBRICATION AND MAINTENANCE

GENERAL INFORMATION

INTRODUCTION

This section gives full details of the service procedures necessary to maintain your tractor at peak efficiency. The lubrication and maintenance chart on page 4-6 provides a ready reference to these requirements, each operation being numbered for easy reference.

CONTENTS

The subjects covered in this section are as listed below. A full index is provided at the back of this book.

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Guard removal 4-5

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10-hour/daily service 4-13

50-hour service 4-14

300-hour service 4-27

600-hour service 4-36

1200-hour/12 month service 4-39

1200-hour/24 month service 4-45

1800-hour service 4-51

General maintenance - as required 4-53

SAFETY PRECAUTIONS

Read and observe all safety precautions listed in 'Servicing the Tractor' in the Introduction section at the front of this Manual.

NOTE: *Dispose of used filters and fluids properly.*

⚠ CAUTION ⚠

Do not check, lubricate, service or make adjustments to the tractor with the engine running.

DURING THE FIRST 50 HOURS OPERATION

In addition to the regular maintenance operations listed, check the following items every 10 hours or daily during the first 50 hours of operation:

- Check transmission/rear axle/hydraulics oil level
- Wheel nuts for tightness
- Front axle hub oil levels

IMPORTANT: *Park the tractor on level ground and, where applicable, extend all cylinders before checking oil levels.*

THE FIRST 50-HOUR SERVICE

At the first 50-hour service, ensure that the following additional service operations are carried out. The items are listed in the 'First 50-Hour Service' checklist (Section 9)

Change engine oil and filter

Change hydraulic oil filters

Check transmission/rear axle/hydraulics oil level

Check FWD differential oil level

Check FWD axle hub oil level

Check and adjust parking brake

Check all air intake connections

Inspect Poly V-belt

Check and adjust compressor drive belt tension (air operated trailer brakes - where fitted)

Tighten all cooling system hose connections.

Check torque of front end weight clamp bolts (where fitted)

Check torque of safety cab or frame mounting bolts

Check torque of exhaust manifold bolts

NOTE: *Items listed in the first 50-hour check are important. If not performed, early component failure and reduced tractor life may result.*

PREVENTING SYSTEM CONTAMINATION

To prevent contamination when changing oils, filters, etc., always clean the area around filler caps, level and drain plugs, dipsticks and filters prior to removal. Before connecting remote cylinders, ensure that oil contained within them is clean, has not degenerated due to long storage and is of the correct grade.

To prevent dirt entry during greasing, wipe dirt from the grease fittings before greasing. Wipe excess grease from the fitting after greasing.

FLEXIBILITY OF MAINTENANCE INTERVALS

The intervals listed in the lubrication and maintenance chart are guidelines to be used when operating in normal working conditions.

Adjust the intervals for environmental and working conditions. Intervals should be shortened under adverse (wet, muddy, sandy, extremely dusty) working conditions.

LUBRICATION AND MAINTENANCE CHART

The chart on page 4-6 lists the intervals when routine checks, lubrication, service and/or adjustments should be performed. Use the chart as a quick reference guide when servicing the tractor. The operations follow the chart.

FUELLING THE TRACTOR

⚠ CAUTION ⚠

When handling diesel fuel, observe the following:

Do not smoke around diesel fuel. Under no circumstances should gasoline, alcohol, gasohol or dieselhol (a mixture of diesel fuel and alcohol) be added to diesel fuel because of increased fire or explosion risks. In a closed container such as a fuel tank they are more explosive than pure gasoline. Do not use these blends. Additionally, dieselhol is not approved due to possible inadequate lubrication of the fuel injection system.

- *Clean the filer cap area and keep it free of debris.*
- *Fill the tank at the end of each day to reduce overnight condensation.*
- *Never take the cap off or refuel with the engine running.*
- *Keep control of the fuel nozzle while filling the fuel tank.*
- *Don't fill the tank to capacity. Allow room for expansion. If the original fuel tank cap is lost, replace it with a genuine original equipment cap and tighten securely.*
- *Wipe up spilled fuel immediately.*

FUEL REQUIREMENTS

The quality of fuel used is an important factor for dependable performance and satisfactory engine life. Fuels must be clean, well-refined, and non-corrosive to fuel system parts. Be sure to use fuel of a known quality from a reputable supplier.

Use Number 2-D in temperatures above -7° C (20° F).

Use Number 1-D in temperatures below -7° C (20° F).

To obtain optimum combustion and minimum engine wear, the fuel selected for use should conform to the application and property requirements outlined in the following 'Diesel Fuel Selection Chart'.

DIESEL FUEL SELECTION CHART

General Fuel Classification	Final Boiling Point (max)	Cetane Rating (min)	Sulphur Content (max)
No. 1-D	288° C (550° F)	40*	0.3%
No. 2-D	357° C (675° F)	40	0.5%

NOTE: *When long periods of idling or cold weather conditions below 0°C (32°F) are encountered or when continuously operating at an altitude above 5,000* ft. *(1500 m) use Number 1-D fuel.*

*****When continually operating at low temperatures or high altitude, a minimum cetane rating of 45 is required.

Using diesel fuel with sulphur content above 0.5% requires more frequent oil changes as noted in the maintenance schedule.

The use of diesel fuel with a sulphur content above 1.3% is not recommended.

For the best fuel economy, use Number 2-D fuel whenever temperatures allow.

Do not use Number 2-D fuel at temperatures below -7° C (20° F). The cold temperatures will cause the fuel to thicken, which may prevent the engine from running. (If this happens, contact your dealer.)

To be sure that a fuel meets the required properties, enlist the aid of a reputable fuel oil supplier. The responsibility for clean fuel lies with the fuel supplier as well as the fuel user.

FUEL STORAGE

Take the following precautions to ensure that stored fuel is kept free of dirt, water and other contaminants.

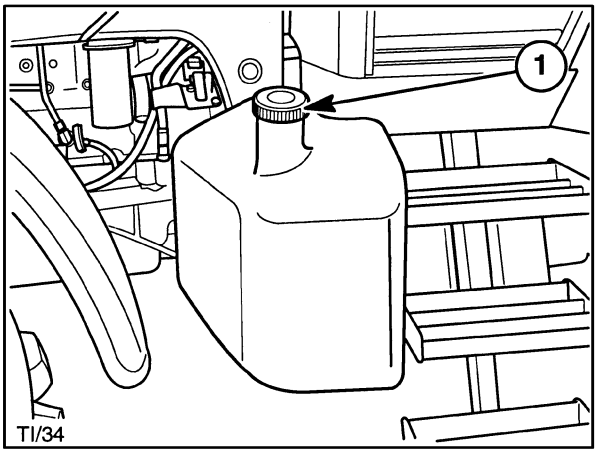
- Store fuel in black iron tanks, not galvanized tanks, as the zinc coating will react with the fuel and form compounds that will contaminate the injection pump and injectors.
- Install bulk storage tanks away from direct sunlight and angle them slightly so sediment in the tanks will settle away from the outlet pipe.
- To facilitate moisture and sediment removal, provide a drain plug at the lowest point at the end opposite the outlet pipe.
- If fuel is not filtered from the storage tank, put a funnel with a fine mesh screen in the fuel tank filler neck when refuelling.
- Arrange fuel purchases so summer grade fuels are not held over and used in winter.

FILLING THE FUEL TANK – Figure 1

1. Clean the area around the fuel cap (1) to prevent dirt from entering tank and contaminating the fuel.

2. Remove the cap and place in a clean area during refuelling. The cap is attached to the fuel tank by a chain to prevent loss.

3. After filling the tank, replace and tighten the fuel cap.



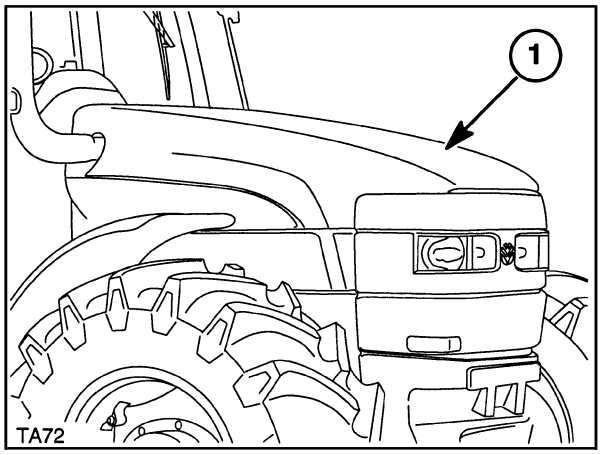
1

NOTE: *The right-hand tank is filled via the filler on the left-hand tank.*

IMPORTANT: *Always replace a lost or damaged cap with a genuine, original equipment replacement cap.*

Fuel tank capacity:

Left-hand tank	220 litres (48.4 Imp. gallons)
Right-hand tank (where fitted)	105 litres (23.1 Imp. gallons)



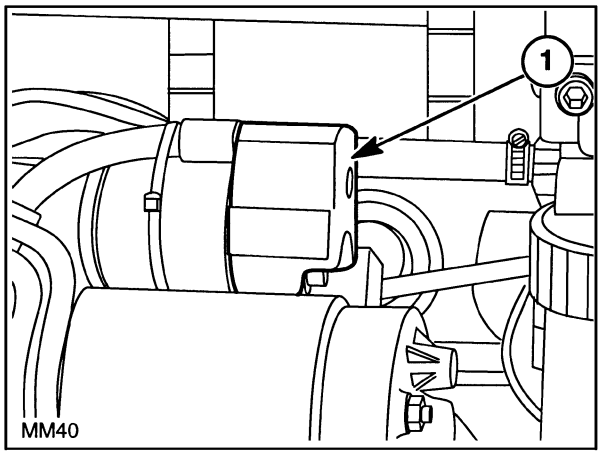
2

GUARDS

ENGINE HOOD – Figure 2

The hood (1) covers the batteries and moving parts of the engine. The hood must be closed and correctly latched before operating the tractor.

Additional guards are provided to prevent the fingers being trapped by the fan/air conditioner drive belt when the hood is lowered to the operating position.



3

STARTER SOLENOID GUARD – Figure 3

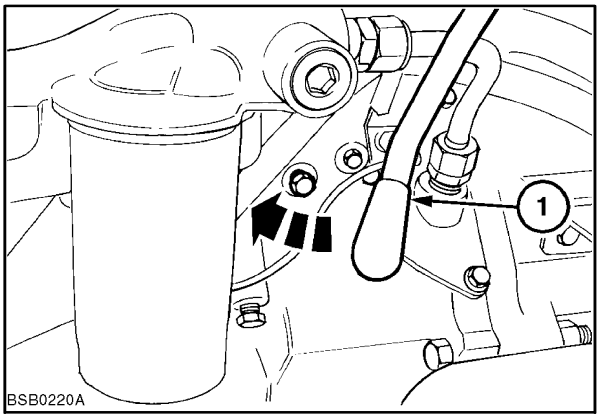
The guard (1) covers the starter solenoid electrical connections to prevent accidental contact. The guard must be installed whenever the batteries are connected to the electrical system.

GUARD REMOVAL

To gain access to perform inspection, lubrication and maintenance operations, the hood and certain access panels may need to be opened or removed.

IMPORTANT: *After performing work on the tractor, install all guards before operating the tractor.*

IMPORTANT: *Follow the guidelines listed under the heading* Servicing the Tractor *in* Safety Precautions - *section 1.*



4

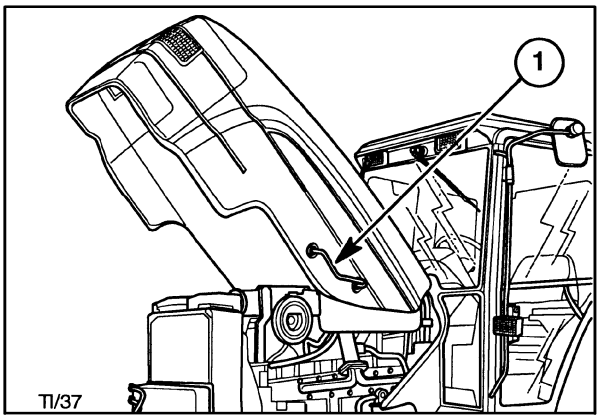
HOOD - Figures 4 and 5

The hood is hinged at the rear to provide easy access to the engine area for routine maintenance. Two gas struts (located under the hood) assist in raising the hood.

To open the hood, move the hood release lever (1) Figure 4, forward, allow it to return, then move it forward a second time to release the locking mechanism.

Using the handle (1) Figure 5, raise the hood. The gas struts will take over and raise the hood to full height, as shown.

To close the hood, pull down on the handle (1) Figure 5. Ensure that the hood straddles the radiator, then pull firmly down to fully close the hood. Check that the hood is properly latched by pulling up on the handle.

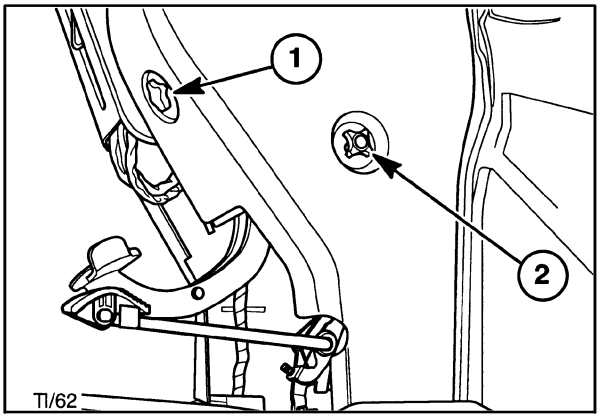


5

INSTRUMENT CONSOLE COVERS - Figure 6

The moulded panels either side of the instrument console may be easily removed for service. Unscrew the two knobs (1) and (2) and remove the right-hand panel to gain access to the fuse box, brake pedals, etc.

More fuses ('maxi' fuses), the engine relay and flasher unit are located behind the left-hand panel which is removed in a similar fashion. See operation 50 for details.



6

LUBRICATION AND MAINTENANCE CHART

Service Interval	Operation No.	Maintenance Requirement	Check	Clean	Lube	Change	Adjust	Drain	Page No.
When warning lamp lights	1	Engine air cleaner outer element	x	x					4-7
	2	Engine coolant level	x				x		4-10
	3	Brake fluid reservoir level	x				x		4-11
	4	Clutch fluid reservoir level (where fitted)	x				x		4-11
	5	Fuel filter/water separator	x					x	4-12
Every 10 hours or daily	6	Engine oil level	x				x		4-13
	7	Windscreen washer reservoir fluid level (where fitted)	x				x		4-13
	8	Air reservoir(s) (air operated trailer brakes)						x	4-14
Every 50 hours	9	Radiator, oil cooler and air conditioner condenser	x	x					4-15
	10	Cab air filters		x					4-16
	#11	All grease fittings			x				4-17
	12	Front and rear wheel nut torque	x				x		4-25
	13	Tyre pressures and condition	x				x		4-26
	14	Remote control valve drain bottle(s)	x						4-26
Every 300 hours	*15	Engine oil and filter				x			4-27
	16	Battery electrolyte level (tropical climates)	x	x			x		4-29
	17	Four wheel drive front axle and hubs oil level	x				x		4-29
	#18	Front wheel bearings (2 wheel drive only)			x				4-30
	#19	Rear axle shafts			x				4-31
	20	Transmission/rear axle/hydraulics oil level	x				x		4-31
	21	Poly V-belt	x						4-32
	22	Compressor drive belt (where fitted)	x				x		4-32
	23	Cab and safety frame mounting bolts torque	x				x		4-33
	24	Parking brake	x				x		4-34
Every 600 hours	25	Hydraulic and transmission oil filters				x			4-35
	26	Engine air cleaner outer element				x			4-36
	27	Engine air intake connections	x						4-36
	28	Engine valve clearance	x				x		4-37
	29	Fuel filter secondary element	x			x			4-38
Every 1200 hours or annually	30	Fuel filter primary element	x			x			4-39
	31	Cab air filters				x			4-40
	32	Transmission/rear axle/hydraulic oil and filter				x			4-41
	33	FWD axle differential oil				x			4-42
	34	FWD axle hub oil				x			4-43
	35	Battery electrolyte level (temperate climates)	x	x			x		4-44
Every 1200 hours or two years	36	Engine coolant				x			4-45
	37	Engine air cleaner inner element				x			4-49
Every 1800 hours	38	Fuel injectors	x	x			x		4-51
General maintenance	39	Bleeding the fuel system	x				x		4-53
	40	Transmission calibration (Dual Command transmission)	x				x		4-53
	41	Transmission calibration (Range Command transmission)	x				x		4-57
	42	Transmission calibration (Power Command transmission)	x				x		4-60
	43	Calibrating the EMU	x				x		4-63
	44	Footbrakes	x				x		4-65
	45	Engine idle speed	x				x		4-66
	46	Automatic pick-up hitch	x				x		4-66
	47	Air conditioner	x						4-66
	48	Headlight and worklamp adjustment	x				x		4-67
	49	Bulb replacement				x			4-67
	50	Fuse replacement				x			4-71

* Oil change interval will be reduced if fuel has a high sulphur content or if the tractor is operated in extremely cold temperatures.

Grease more frequently when operating in very wet, muddy or extremely dusty conditions.

WHEN THE WARNING LAMP LIGHTS

OPERATION 1
SERVICE THE ENGINE AIR CLEANER
– Figures 7 to 14

Clean the outer element when the restriction indicator light on the instrument console illuminates or every 600 hours, whichever comes first. If the indicator light illuminates, perform the service within one hour of operation.

IMPORTANT: *Clean the outer element only when the restriction light illuminates or after 600 hours of operation. Cleaning the filter too frequently will decrease the service life of the filter.*

The air cleaner is accessible from the left-hand side on TM115, TM125 and TM135 models (see Figure 7) and from the right-hand side on TM150 and TM165 models (Figure 8).

Figure 9 shows the outer element being removed from from the right-hand side of a TM150 or TM165 tractor. The removal of the element from other models is similar.

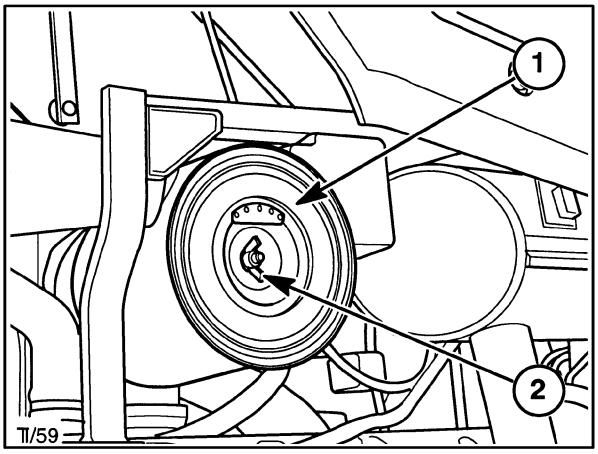
1. Unscrew the wing nut (2) Figure 7, 8 or 9 and remove the outer element (1) from the air cleaner assembly.

IMPORTANT: *Do not remove or disturb the inner element (3) Figure 9.*

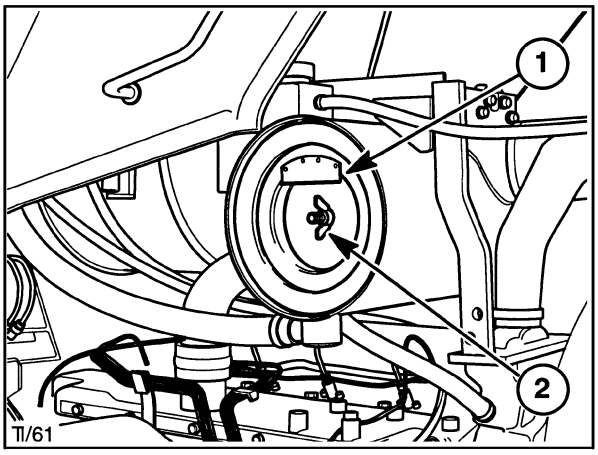
2. Examine the inside of the outer element. If dust is present, the outer element is defective and must be replaced. The inner element should also be replaced at this time.

3. Clean the outer element using either method A, B, or C, depending on the element's condition

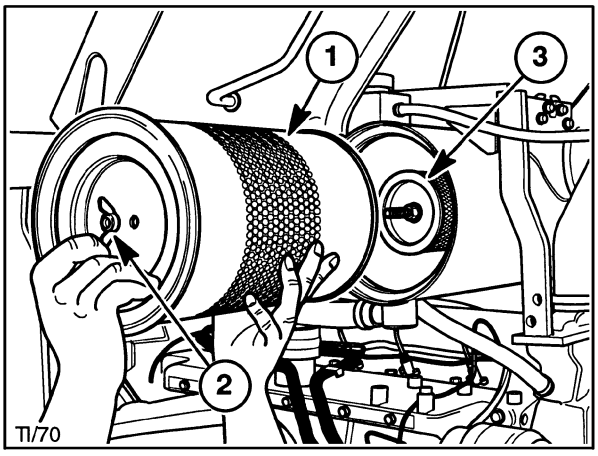
- Methods A or B should be used for dry dust.



7



8



9

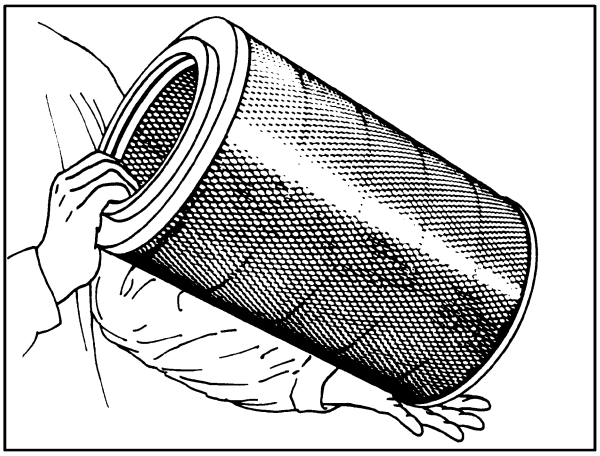
Method C should be used if the element is sooty, oily or heavily contaminated or after cleaning the element five times using methods A or B.

NOTE: *An outer element may be dry cleaned (methods A or B) up to 5 times or washed (method C) once only, prior to replacement.*

Method A

Lightly tap the ends of the element against the palm of the hand. See Figure 10.

IMPORTANT: *Do not tap the element against a hard surface as this will damage the element.*



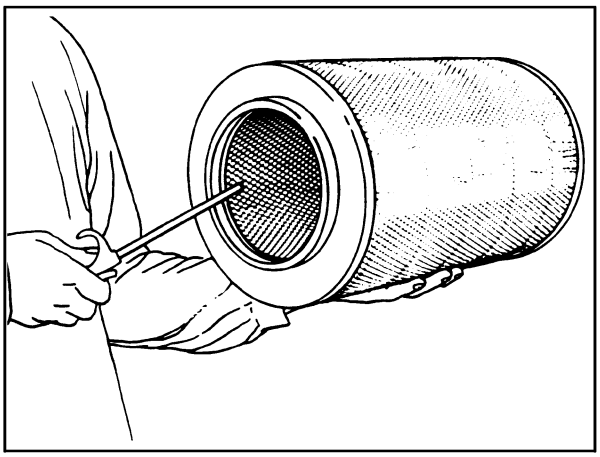
10

Method B

Use compressed air, not exceeding 2 bar (30 lbf/in^2). Insert the air line nozzle inside the element. Hold the nozzle 150 mm (6 in.) from the element and blow the dust from the inside through the element to the outside. See Figure 11.

⚠ WARNING ⚠

Wear eye protection and a face mask when carrying out this operation.



11

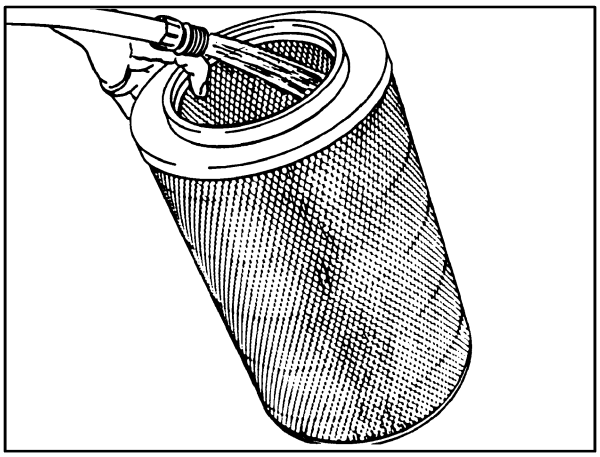
Method C

Immerse the element in warm water containing a small amount of non-sudsing detergent. Allow to soak for at least 15 minutes. Keep the open end of the element above the water line.

IMPORTANT: *Never use fuel oil, gasoline, solvent or water hotter than the hand can stand, otherwise the filter element may be damaged.*

After soaking, agitate the element in the water, taking care not to allow dirty water outside the element to splash over to the inside.

Rinse the element with clean, running water. Rinse from the inside of the element through to the outside until the water is free of dirt. If a hose is used, do not exceed 2 bar (30 lbf/in^2). A gentle trickle of water is sufficient and will ensure that the element is not ruptured. See Figure 12.



12

Shake out excess water from the element and allow to air dry naturally. Do **not** use compressed air, a light bulb or heat to dry the element.

NOTE: *It usually takes one to three days for a filter element to dry.*

IMPORTANT: *Do not attempt to dry the element with heat or compressed air and do not install until thoroughly dry as it may rupture. It is recommended that a new or previously cleaned element be installed at this service and the washed element put aside for installation at the next service. The spare element should be stored in a dry place and wrapped to prevent dust contamination or damage.*

NOTE: *An outer filter element may be washed once only.*

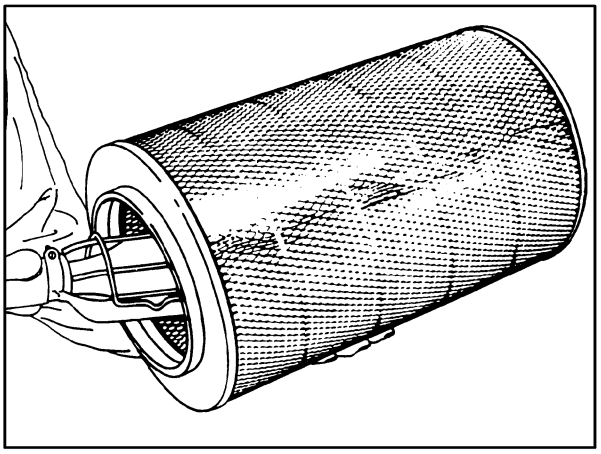
4. Examine the element for damage by placing a light inside the element. See Figure 13. Discard the element if pin pricks of light can be seen or if there are areas where the paper appears thin.

5. Check the element material for bunching; the metal casing for distortion and the rubber gasket for damage. Discard the filter element if it is damaged.

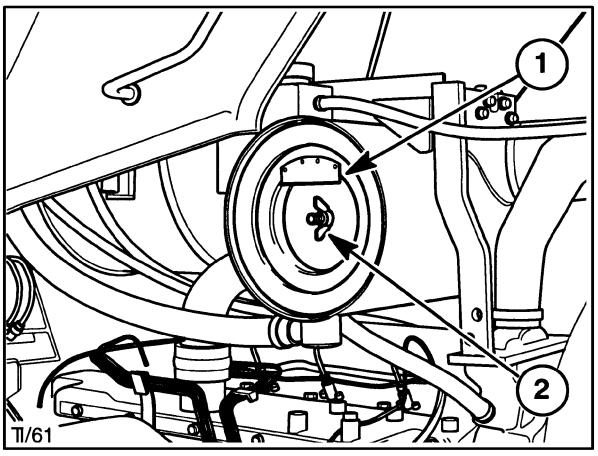
6. Clean the inside of the air cleaner housing using a damp, lint-free cloth on a probe. Do not damage the inner filter element. Ensure that the inner end of the housing is clean and smooth, to ensure a good seating for the rubber seal on the element.

7. Install the cleaned outer element or a new outer element (1) Figure 14. Check the wing nut seal and tighten the wing nut (2). Replace the wing nut/seal assembly if damaged.

If the restriction indicator light continues to illuminate after cleaning the element, the outer or inner element may need replacing. See operations 26 and 37.



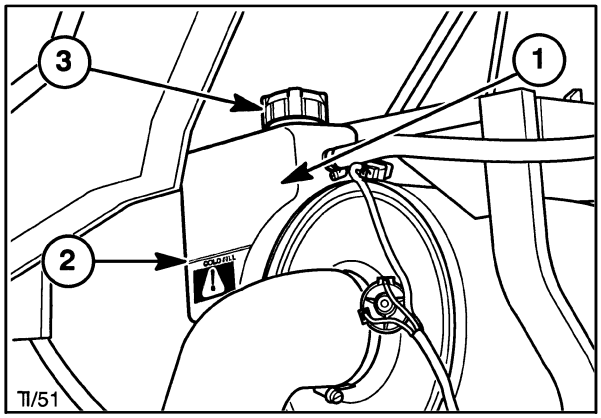
13



14

OPERATION 2
CHECK ENGINE COOLANT LEVEL
- Figure 15

When the low coolant level indicator light on the instrument console illuminates, stop the engine and check the coolant level.



15

⚠ WARNING ⚠

The cooling system operates under pressure which is controlled by the pressure cap on the coolant expansion tank. It is dangerous to remove the cap while the system is hot. When the system has cooled, use a thick cloth and turn the pressure cap slowly to the first stop and allow the pressure to escape before fully removing the cap. Never remove the cap from the top of the radiator unless the expansion tank pressure cap has first been removed.

⚠ CAUTION ⚠

Coolant should be kept off the skin. Adhere to the precautions outlined on the coolant filter and antifreeze container.

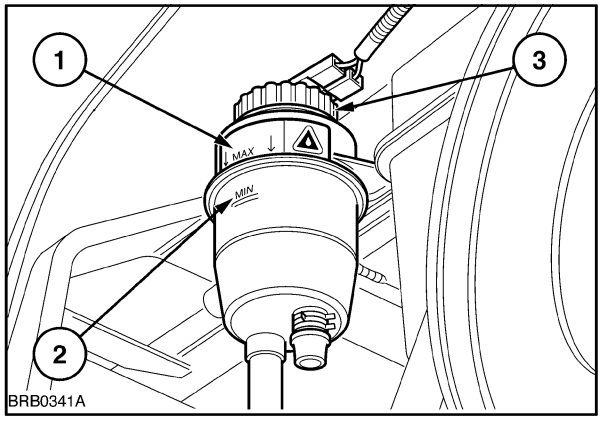
Check the coolant level in the recovery tank (1) when the engine is cold. The coolant level should be above the bottom line (2) on the recovery tank. If coolant is required, remove the pressure cap (3) and add a 50/50 water and antifreeze mixture as specified in section 8 of this Manual.

NOTE: *If no coolant is visible in the recovery tank, the coolant level must be checked in the radiator. Check the system for leaks and repair as required.*

Remove the radiator filler cap when the system is cold. Add coolant as required to bring the level to just below the top of the filler neck. Install the cap and add coolant to the recovery tank, as described above.

OPERATION 3
CHECK BRAKE FLUID LEVEL - Figure 16
If the indicator light on the instrument panel signals low brake fluid, check the level in the reservoir.

The brake fluid reservoir is located under the the hood, on the right-hand side, behind the coolant recovery tank. Visually check the level of the fluid in the reservoir. It should **never** be allowed to fall below the 'MIN' line (2) moulded into the bottle. If necessary, remove the filler cap (3) and top up with the correct brake/clutch mineral oil to the 'MAX' line (1) as shown on the decal. Do not overfill.



16

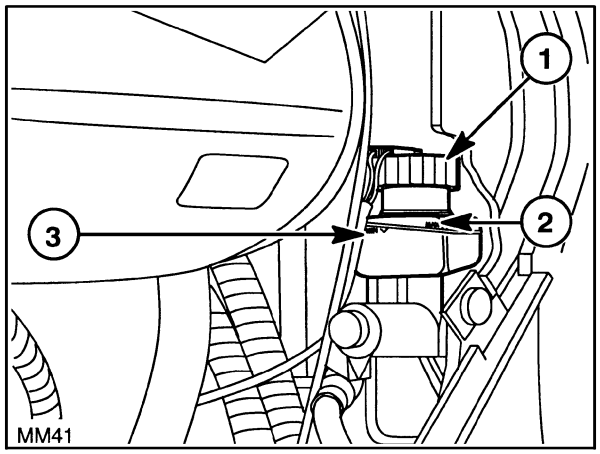
WARNING

Use only the correct type of brake/clutch mineral oil. Mixing different types of fluid may cause damage to internal hydraulic braking components and result in brake failure. Brake/clutch fluid should be kept off the skin. Adhere to the instructions on the brake fluid container. See section 8 for correct brake fluid specification.

IMPORTANT: *Take care not to spill brake/clutch fluid on the tractor as it may damage the paintwork.*

OPERATION 4
CHECK CLUTCH FLUID LEVEL (Synchro Command transmission only) - Figure 17
If the indicator light on the instrument panel signals low clutch fluid, check the level in the reservoir.

The clutch fluid reservoir is located under the rear of the hood on the left-hand side. Visually check the level of the fluid in the reservoir. It should not be allowed to fall below the 'MIN' line (3) moulded into the bottle. If necessary, remove the filler cap (1) and top up with the correct brake/clutch mineral oil to the 'MAX' line (2). Do not overfill.



17

WARNING

Brake/clutch fluid should be kept off the skin. Adhere to the instructions on the container. Use only the correct type of brake/clutch fluid. Mixing different types of fluid may cause damage to internal hydraulic clutch components. See section 8 for correct clutch mineral oil specification.

IMPORTANT: *Take care not to spill brake/clutch fluid on the tractor as it may damage the paintwork.*

OPERATION 5
DRAIN FUEL SYSTEM WATER SEPARATOR - Figure 18

IMPORTANT: *Before loosening or disconnecting any part of the fuel injection system, thoroughly clean the area to be worked on to prevent contamination.*

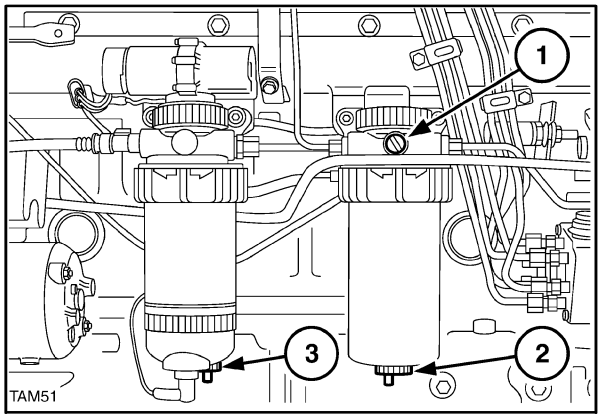
If the indicator light on the instrument panel signals the presence of water in the fuel sedimenter, drain the fuel filter and sedimenter assembly, as follows:

1. Loosen the bleed screw (1) on the front filter assembly.

2. Open the drain plugs on the sedimenter and filter by loosening the knobs (2) and (3).

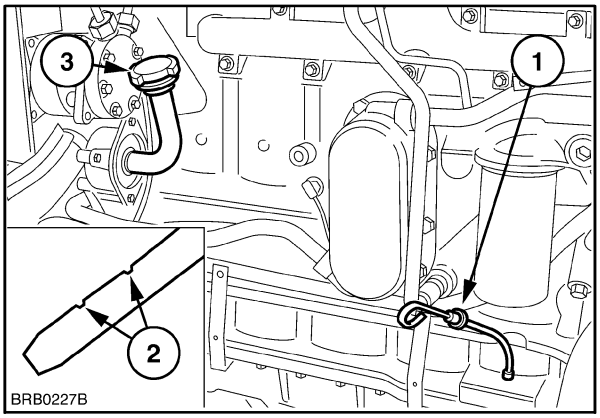
3. Allow contaminated fuel to drain until only clean fuel runs out. Catch the fuel in a suitable container and dispose of properly. Close both drain plugs.

4. Turn on the key-start switch to actuate the electric fuel pump and bleed the filter. When fuel, free of air bubbles is emitted from the bleed screw hole (1), tighten the bleed screw and turn the key-start switch off.



18

EVERY 10 HOURS OF OPERATION OR DAILY (whichever occurs first)



19

OPERATION 6
CHECK ENGINE OIL LEVEL - Figure 19
Check the oil level when the tractor is parked on a level surface and after the engine has been stopped for a minimum of five minutes.

1. Remove the dipstick (1) from the left-hand side of the engine, wipe clean and re-insert fully.

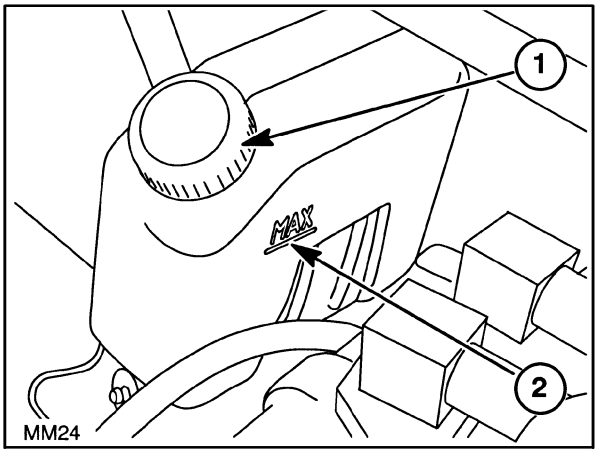
2. Pull the dipstick out again and check the oil level. The oil level should fall between the notches (2) on the dipstick.

3. If more oil is required, remove the filler cap (3) and add fresh oil until the level is between the two notches on the dipstick. The quantity of oil represented by the upper and lower notches is approximately 1.8 litres (3.1 Imp. pints).

NOTE: *Do not fill above the upper notch on the dipstick. Excess oil will burn off, creating smoke and give a false impression of oil consumption. Do not operate the engine with the oil level below the lower notch.*

4. Re-install the filler cap.

See section 8 for the correct oil specification and viscosity.



20

OPERATION 7
CHECK WINDSCREEN WASHER RESERVOIR (where fitted) - Figure 20
The reservoir for the windscreen washers is located beneath the rear of the cab on the left-hand side. The same reservoir is utilised for both front and rear windscreen washers.

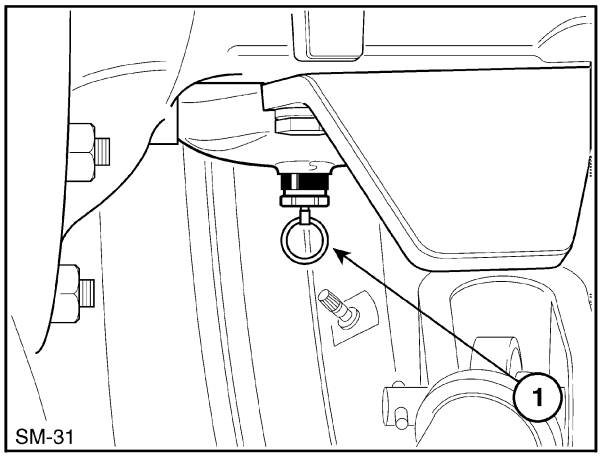
Lift off the cap (1) and fill with washer solvent solution up to MAX mark (2) on the side of the bottle. In cold weather, use a solvent with anti-freeze properties.

OPERATION 8
DRAIN THE AIR RESERVOIR(S) (Air operated trailer brakes - where fitted) - Figure 21
Every 10 hours or daily, whichever occurs first, drain the air reservoir(s). When two air reservoirs are fitted, ensure both are drained daily.

Firmly apply the tractor handbrake, block all wheels and switch off the engine.

All pneumatic trailer braking systems have an air reservoir located beneath the left-hand end of the rear axle. Tractors with single line braking systems have an additional air reservoir located under the right-hand end of the axle. The reservoirs are accessible from the rear of the tractor.

There is a plunger on the base of each reservoir. To drain a reservoir, move the plunger (1) laterally, in any direction, and allow air pressure and any accumulated water to escape. The reservoirs will recharge with air when the engine is restarted.



21

EVERY 50 HOURS Complete the preceding operations plus the following:

OPERATION 9
CLEAN THE RADIATOR, OIL COOLER AND AIR CONDITIONER CONDENSER CORES - Figures 22 and 23

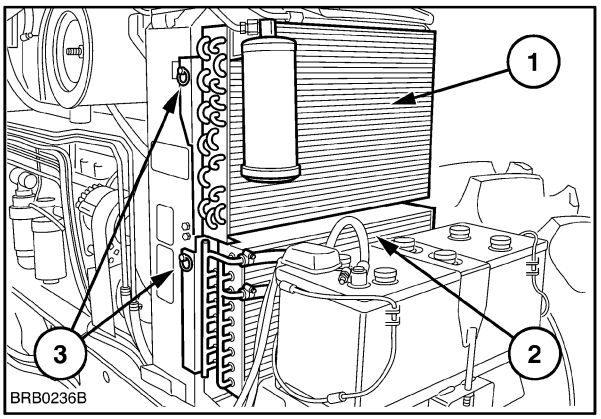
Check the cores for chaff accumulation or blockage. If any is noted, clean as follows:

⚠ CAUTION ⚠

Wear eye protection and protective clothing during the cleaning process. Clear the area of bystanders so they are not struck by flying particles.

1. For cleaning, use compressed air or a pressure washer not exceeding 7 bar (100 lbf/in^2).

2. The air conditioner condenser (1) Figure 22 and the transmission oil cooler (2) have a slide out facility for ease of service. Turn the two quick release fasteners (3) anti-clockwise to unlock.

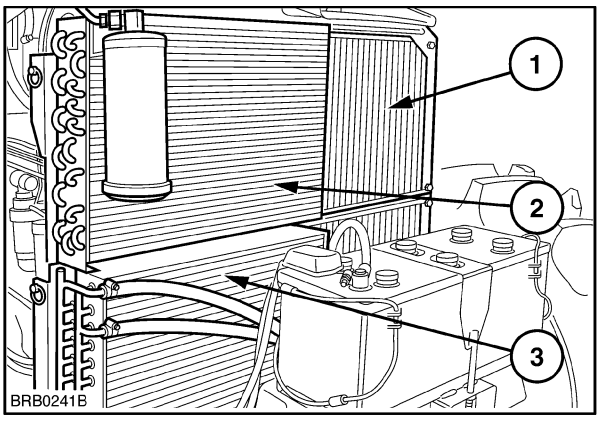


22

3. Slide the transmission oil cooler (3) Figure 23 and the air conditioner condenser (2) (where fitted) out, as shown, to gain access to the radiator (1).

4. Direct the air or water through each core from the back to the front. Clean the radiator first, then the air conditioner condenser and, finally, the transmission oil cooler. Carefully straighten any bent fins.

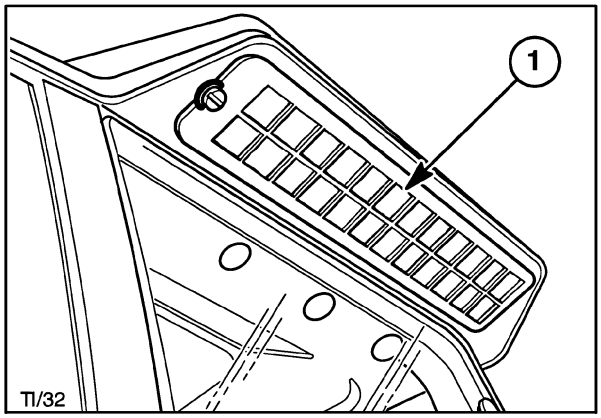
NOTE: *If the cores are blocked with any oily substances, apply a detergent solution and remove it with a pressure washer.*



23

OPERATION 10
CLEAN THE CAB AIR FILTERS (where fitted) - Figures 24 to 25

Air drawn into the cab by the blower fan passes through two external filters (1) Figure 24, one each side of the cab roof. In addition, two recirculation filters are provided. These filters are installed in the inner roof panel of the cab, one each side, see Figure 26.



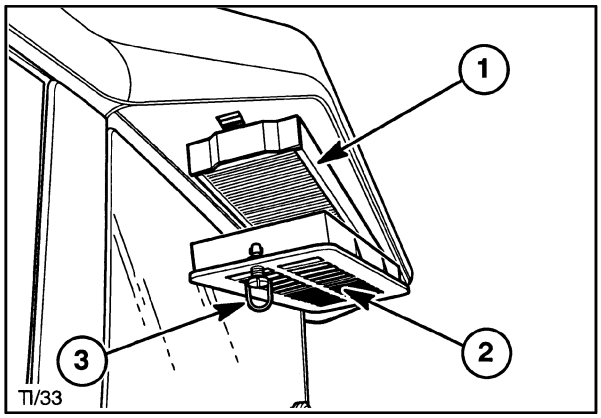
24

Before servicing the filters, switch off the blower and close the roof hatch (where fitted), all windows and one door. Slam the other door closed. The resulting back pressure will dislodge most of the loose dirt from the underside of the filters.

NOTE: *In humid conditions, such as occur on most early mornings, do* ***not*** *switch on the blower prior to servicing the filters. Damp particles drawn into a filter may be difficult to remove.*

External Filters

To remove an external filter, turn the quick release fastener (3) Figure 25, $^{1}/_{2}$ a turn anti-clockwise to free the front of the filter cover (2). Remove the cover (2) and filter element (1).



25

NOTE: *The filters are made of specially treated media with a rubber sealing strip bonded to the lower surface. Take care not to damage the element during removal.*

Clean the elements by blowing with compressed air not exceeding 2 bar (30 lbf. in^2). Blow the dust from the clean side through the element to the dirty side. Hold the nozzle at least 300 mm (12 in.) from the element to prevent damage to the filter media.

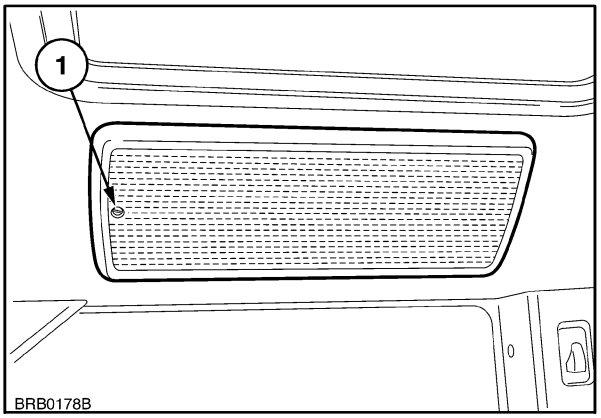
IMPORTANT: *Do not wash the filter as the element will be damaged.*

Clean both filter chambers with a damp, lint-free cloth. Re-install the filter elements with the clean side uppermost and re-install the cover.

NOTE: *The filters should be cleaned more frequently when operating in extremely dusty conditions.*

Internal Filters

To remove an internal filter, turn the captive screw (1) Figure 26, anti-clockwise and remove the filter cover.



26

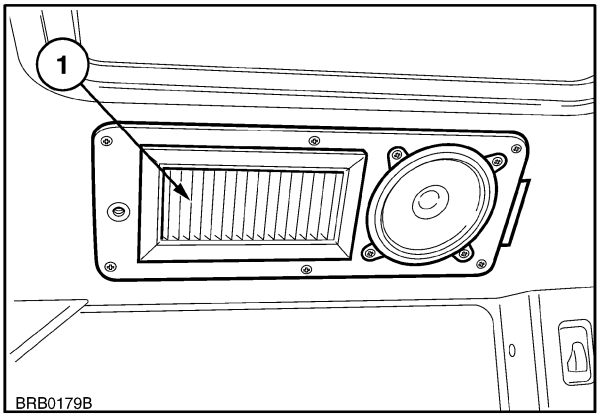
Remove the filter (1) Figure 27 from it's housing.

NOTE: *The filters are made of specially treated media with a rubber sealing strip bonded around the sides. Take care not to damage the element during removal.*

Clean the elements by blowing with compressed air not exceeding 2 bar (30 lbf. in^2). Blow the dust from the clean side through the element to the dirty side. Hold the nozzle at least 300 mm (12 in.) from the element to prevent damage to the paper pleats.

IMPORTANT: *Do not wash the filter as the element will be damaged.*

Clean both filter chambers with a damp, lint-free cloth. Re-install the filter elements with the clean side uppermost and re-install the covers.



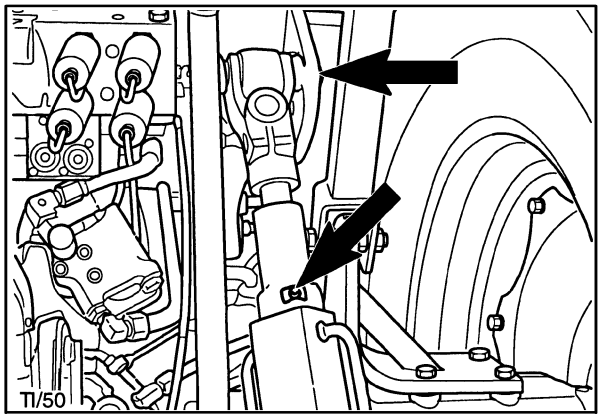
27

OPERATION 11
ALL GREASE FITTINGS - Figures 28 to 46

Oil all pivots and apply a grease gun to the lubrication fittings, as shown in Figures 28 to 46 inclusive.

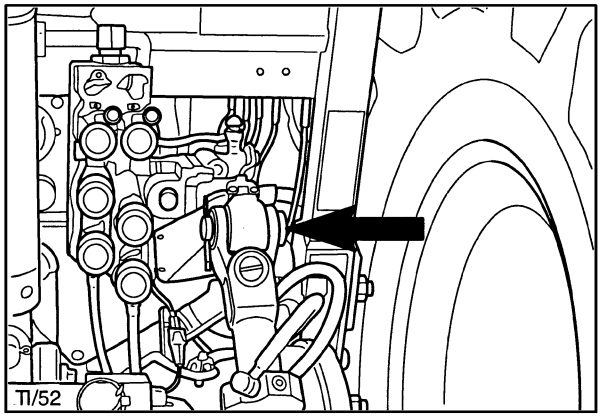
See section 8 for the correct grease specification.

Right and Left-hand Lift Rod (with turnbuckle adjustment) - Figure 28
Apply a grease gun to the lubrication fittings, as shown.



28

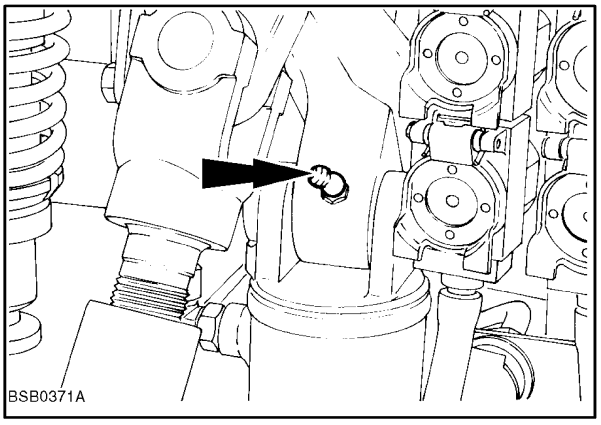
Right-hand Lift Rod (with hydraulic adjustment) - Figure 29
Apply a grease gun to the lubrication fitting, as shown.



29

Assister Ram (where fitted) - Figure 30
Apply a grease gun to the lubrication fitting, as shown.

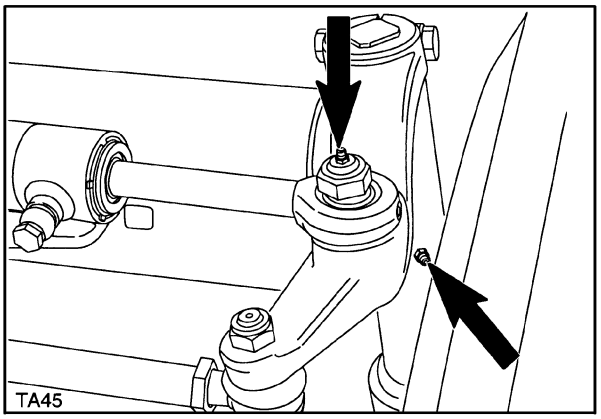
If an assister ram is installed on the right-hand side, there will be a similar grease fitting, located as shown.



30

Front Wheel Spindles and Right-hand Steering arm (2WD axle) - Figure 31
Apply a grease gun to the lubrication fittings, as shown.

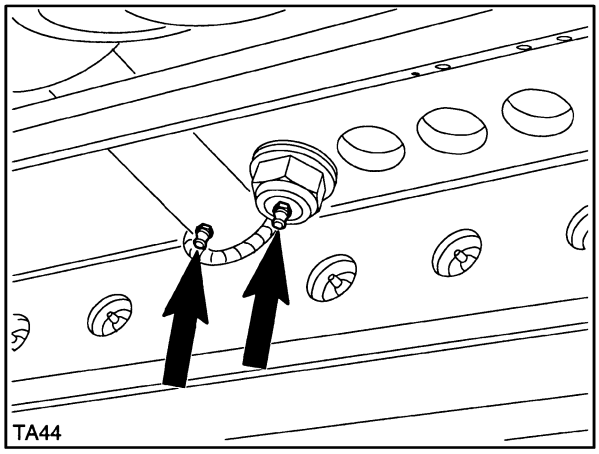
NOTE: *There is a grease fitting on both front wheel spindles. However, there is no grease fitting on the left-hand steering arm. This joint is sealed and lubricated for life.*



31

Front Trunnion Pin (2WD axle) - Figure 32

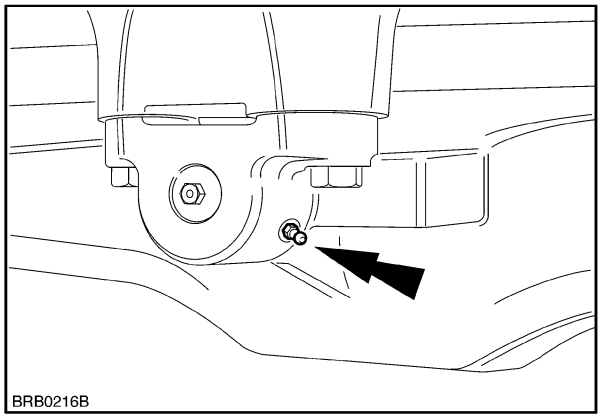
Apply a grease gun to the lubrication fitting, as shown.



32

Front Trunnion Pin (standard 4WD axle) - Figure 33

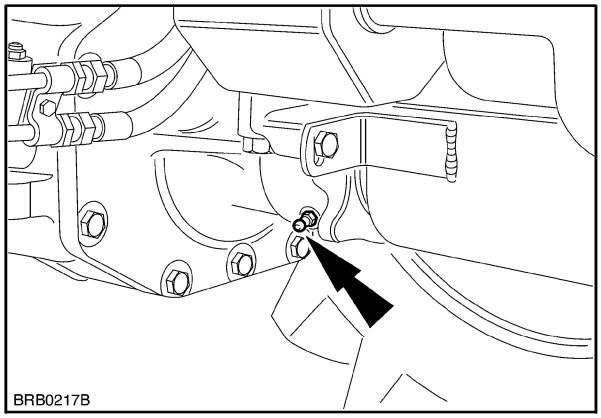
Apply a grease gun to the lubrication fitting, as shown.



33

Rear Trunnion Pin (standard 4WD axle) - Figure 34

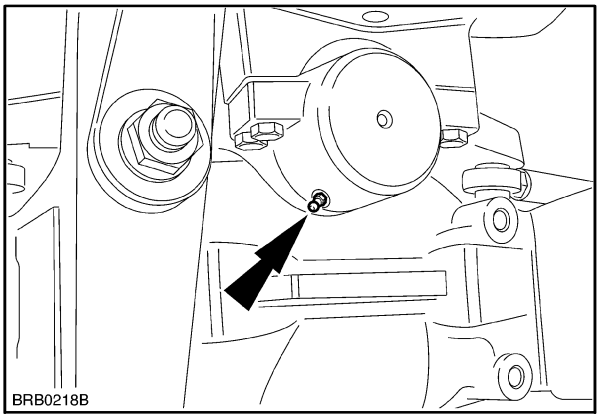
Apply a grease gun to the lubrication fitting, as shown.



34

Trunnion Pin (Supersteer 4WD axle) - Figure 35

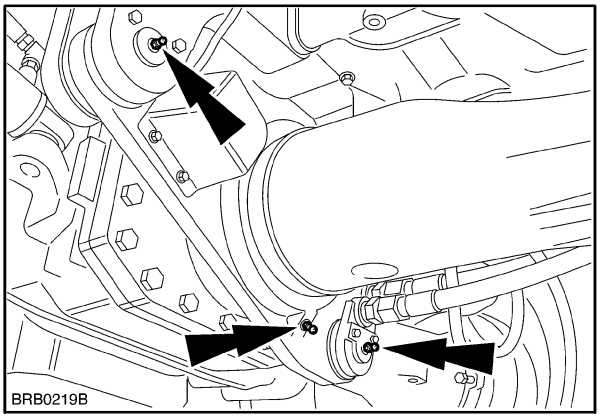
Apply a grease gun to the lubrication fitting, as shown.



35

Trunnion Pin, Suspension Damper Pivot and Panhard Rod Pivot (suspended 4WD axle) - Figure 36

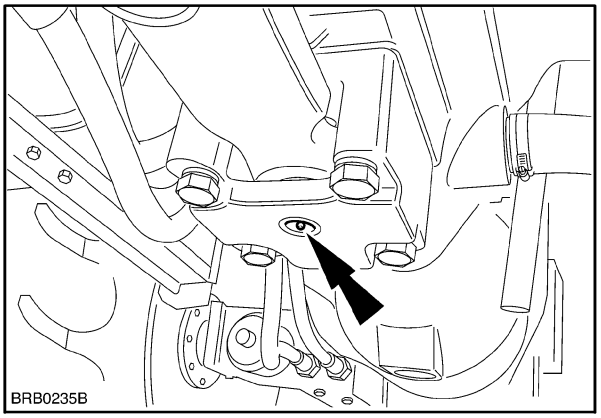
Apply a grease gun to the lubrication fittings, as shown.



36

Suspension Arm (suspended 4WD axle) - Figure 37

Apply a grease gun to the lubrication fitting at the rear of the suspension arm, located beneath the tractor, in front of the transmission.

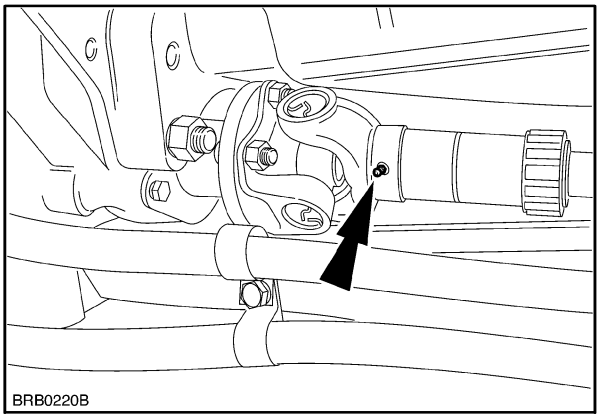


37

Drive Shaft Universal Joint (suspended and SuperSteer axles only) – Figure 38

Apply a grease gun to the lubrication fitting, as shown.

NOTE: *The grease fittings shown is at the rear of the drive shaft. On some models, the shield completely covers the drive shaft and a hole is provided for access.*

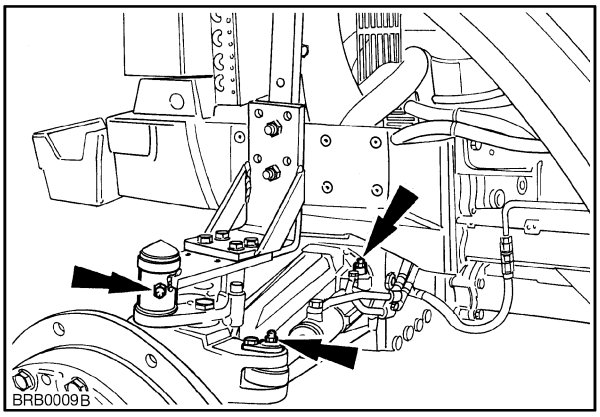


38

Steering Cylinders (all 4WD axles) and Dynamic Front Fenders (where fitted) – Figure 39

Apply a grease gun to the lubrication fittings, as shown.

NOTE: *The left-hand end of the axle is shown. There are similar grease fittings on the right-hand steering cylinder and fender mount.*

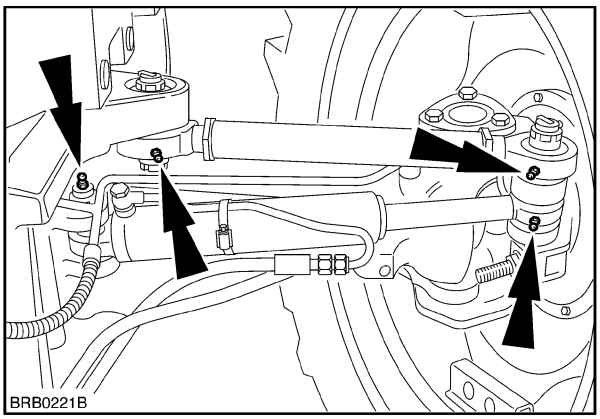


39

Steering Cylinders and Track Rods (SuperSteer 4WD axle) – Figure 40

Apply a grease gun to the lubrication fittings, as shown.

NOTE: *The right-hand end of the axle is shown. There are similar grease fittings on the left-hand steering cylinder and track control rod.*

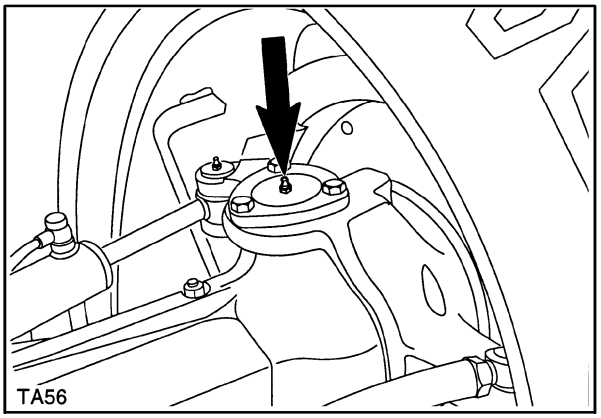


40

Upper Swivel Bearings (all 4WD axles) – Figure 41

Apply a grease gun to the lubrication fitting, as shown.

NOTE: *The left-hand swivel bearing is shown. There is a similar grease fitting on the right-hand swivel bearing.*

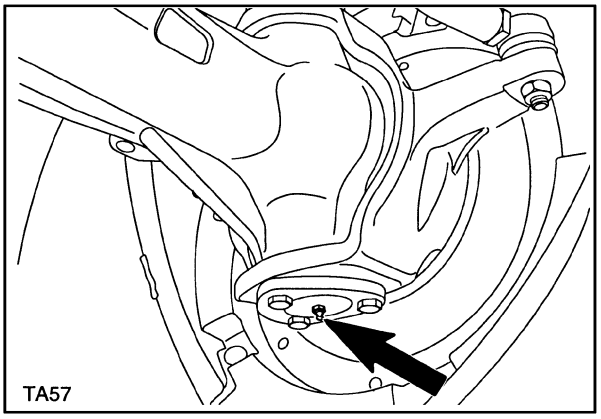


41

Lower Swivel Bearings (all 4WD axles) – Figure 42

Apply a grease gun to the lubrication fitting, as shown.

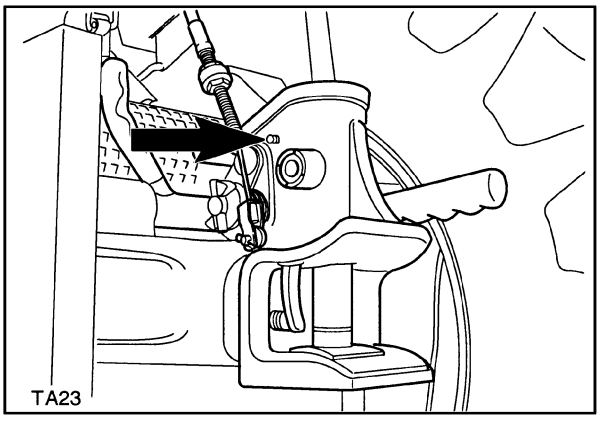
NOTE: *The left-hand swivel bearing is shown. There is a similar grease fitting on the right-hand swivel bearing.*



42

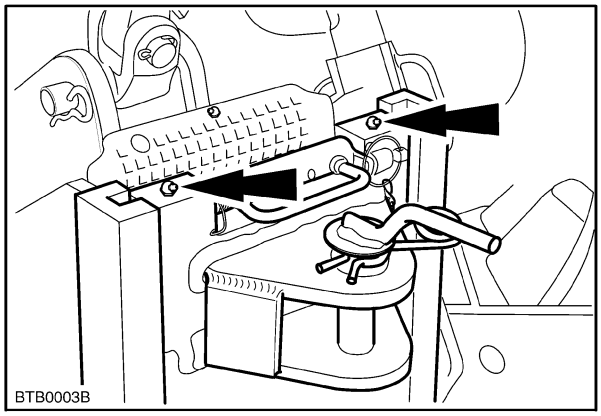
Rear Tow Hitch (auto engagement type) – Figure 43

Apply a grease gun to the lubrication fitting, as shown.



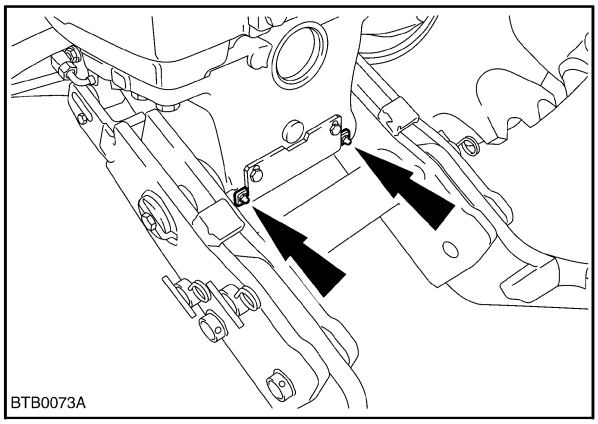
43

Rear Tow Hitch (with slider frame) - Figure 44
Apply a grease gun to the lubrication fittings, as shown.



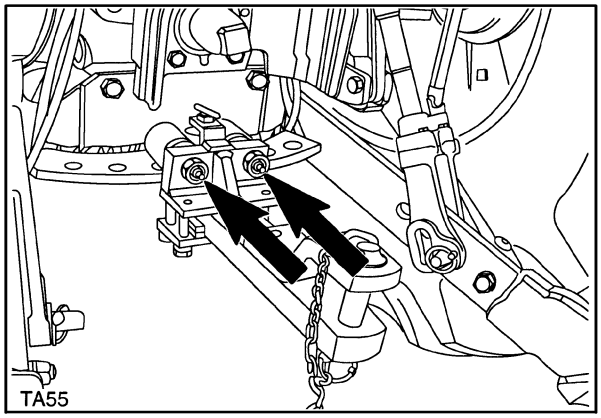
44

Front Hitch - Figure 45
Apply a grease gun to the lubrication fittings, as shown.



45

Heavy Duty Roller Drawbar - Figure 46
Apply a grease gun to the lubrication fittings, as shown.



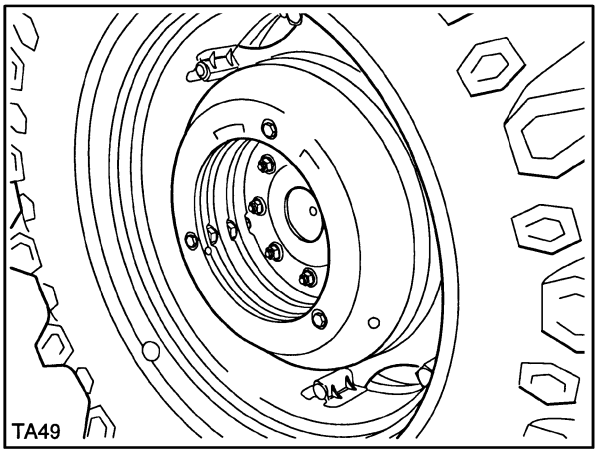
46

OPERATION 12
CHECK FRONT AND REAR WHEEL NUTS
– Figures 47 and 48

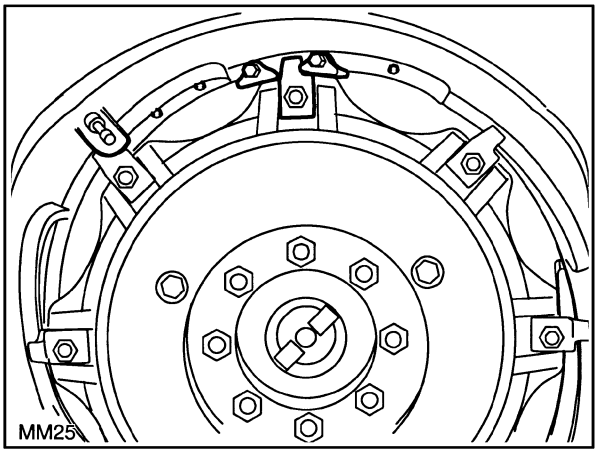
Check the front and rear wheel nuts for tightness using a torque wrench (with a torque multiplier, where necessary). A manual adjust wheel is shown in Figure 47 and a power adjust wheel in Figure 48.

The specified torque figures are shown in the following table:

Two wheel drive –	
Front disc to hub bolts	300 Nm (220 lbf. ft.)
Four wheel drive – Manual adjust front wheels	
Front disc to hub nuts	210 Nm (155 lbf. ft.)
Front disc to rim nuts	240 Nm (177 lbf. ft.)
Four wheel drive – Power adjust front wheels	
Front disc to hub bolts	210 Nm (155 lbf. ft.)
Disc to rim clamp nuts	245 Nm (180 lbf. ft.)
Manual adjust rear wheels	
Disc to hub nuts	250 Nm (184 lbf. ft.)
Disc to rim nuts (34 in. rims)	240 Nm (177 lbf. ft.)
Disc to rim nuts (38 in. rims)	280 Nm (207 lbf. ft.)
Power adjust rear wheels	
Disc to hub nuts	250 Nm (184 lbf. ft.)
Disc to rim clamp nuts	245 Nm (180 lbf. ft.)
Bar axle	
Split collet bolts	300 Nm (220 lbf. ft.)
Disc to hub nuts – steel discs	260 Nm (190 lbf. ft.)
Disc to rim nuts – cast discs	450 Nm (330 lbf. ft.)
Disc to rim nuts – steel discs:	
with M16 bolts	225 Nm (166 lbf. ft.)
with M18 x 125 mm bolts	360 Nm (266 lbf. ft.)
with M18 x 65 mm bolts	450 Nm (330 lbf. ft.)



47



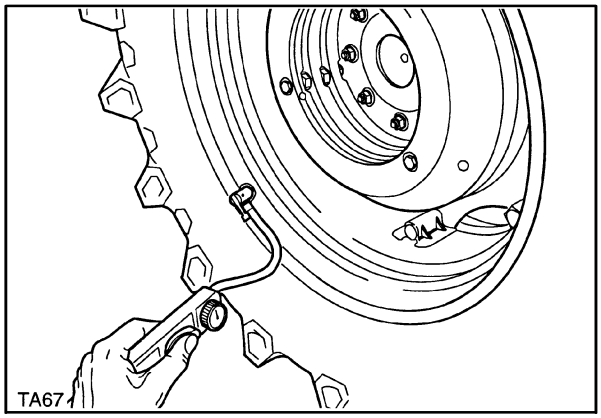
48

OPERATION 13
CHECK TYRE PRESSURES AND TYRE CONDITION - Figure 49

Check and adjust the front and rear tyre pressures. Inspect the tread and sidewalls for damage.

Adjust the tyre pressures to suit the load being carried. See 'Tyre Pressures and Permissible Loads' in Section 3.

NOTE: *If the tyres are ballasted with a calcium chloride/water solution, use a special tyre gauge as the solution will corrode a standard-type gauge. Check pressure with the valve stem at the bottom.*



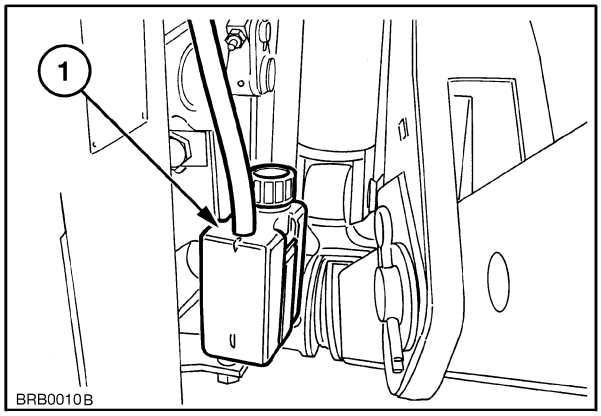
49

OPERATION 14
CHECK REMOTE CONTROL VALVE DRAIN BOTTLE(S) - Figure 50

Every time a hydraulic hose is connected and disconnected, a small amount of oil is discharged from the remote control valve coupler. A drain tube leads from each pair of remote control valves to a translucent bottle (1) located low down on the right-hand side of the rear axle centre housing.

NOTE: *If 3rd. and 4th. remote valves are installed, a second drain bottle is provided on the left-hand side of the rear axle centre housing.*

Visually check the oil level in the bottle(s). If necessary, unclip the bottle, remove the cap and discard the oil. Re-install the bottle, ensuring that the drain tube is still properly connected.



50

EVERY 300 HOURS carry out the preceding checks plus the following:

ENGINE OIL CHANGE PERIOD

IMPORTANT: *Operation 15 depicts the normal 300 hour engine oil and filter change period.*

Cold Temperature Operation

Engines operating in temperatures below -12° C (10° F) or in arduous conditions should have the oil changed every 150 hours of operation. (The oil filter need only be changed at the normal 300 hour service interval).

Diesel Fuel Sulphur Content

In some countries, locally available diesel may have a high sulphur content, in which case the oil change period should be adjusted, as follows:

- *Sulphur content between 0.5 and 1.0% - change engine oil every 150 hours.*
- *Sulphur content between 1.0 and 1.3% - change engine oil every 75 hours.*

If in doubt, follow the engine oil change recommendations on the decal affixed to the underside of the hood.

OPERATION 15
ENGINE OIL AND FILTER - Figures 51 to 53

Run the engine until it is warm before changing the oil and filter. Park the tractor on level ground and stop the engine. Engage the parking brake.

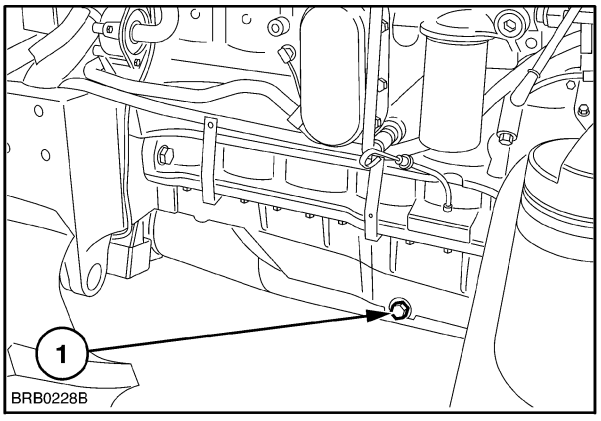
⚠ WARNING ⚠

Be very careful to avoid contact with hot engine oil. If the engine oil is extremely hot, allow it to cool to a moderately warm temperature before proceeding.

To change the oil and filter:

1. Remove the engine oil drain plug (1) Figure 51, from the left-hand side of the engine and catch the oil in a suitable container. Dispose of the oil properly.

2. Replace the drain plug after oil has drained.

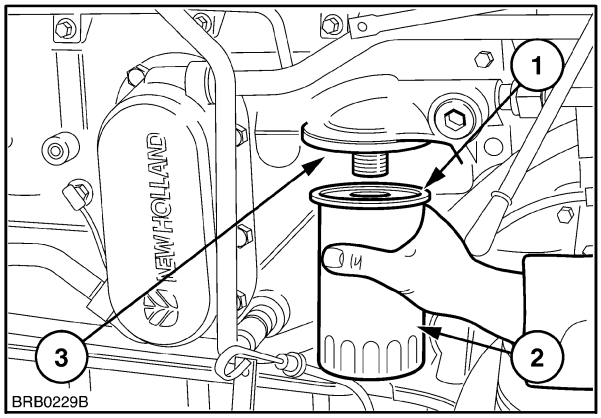


51

3. Clean the oil filter area. Unscrew the oil filter (2) Figure 52 and discard.

4. Clean the filter mounting surface (3).

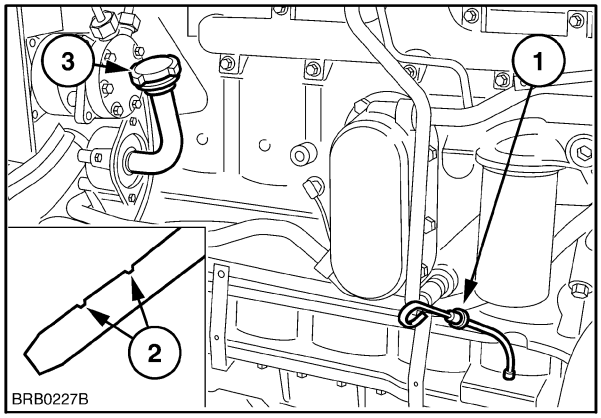
5. Apply a thin film of clean oil on the new oil filter sealing ring (1) and install the filter. Turn until the sealing ring contacts the mounting surface, then tighten an additional $^{3}/_{4}$ to 1 full turn. Do **not** overtighten.



52

6. Remove the filler cap (3) Figure 53 and fill with approximately 17 litres (30 Imp. pints) (18 U.S. qts.) of fresh oil of the correct grade and viscosity.

7. Start and run the engine at idle speed for 3 minutes, then stop the engine.



53

8. Check the drain plug and oil filter areas for leaks.

9. Wait 5 minutes to allow the oil to drain into the crankcase, then check the oil level on the dipstick (1) Figure 53. The oil level should fall between the notches (2). Add more oil, as required.

NOTE: *Do not fill above the upper notch on the dipstick. Excess oil will burn off, creating smoke and give a false impression of oil consumption. Do not operate the engine with the oil level below the lower notch.*

10. Re-install the filler cap.

See section 8 for the correct oil specification.

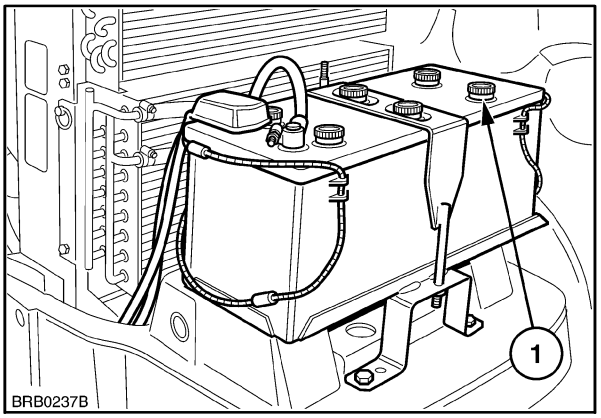
Oil Capacity (including filter): 19 litres (33.4 Imp. pints) (20 U.S. qts.)

OPERATION 16
BATTERIES

IMPORTANT: *This operation applies only to batteries on tractors operating in* ***tropical*** *climates. Tractors operating in temperate climates should have the battery electrolyte level checked every 1200 hours or 12 months. See operation 35.*

Single Battery - Figure 54

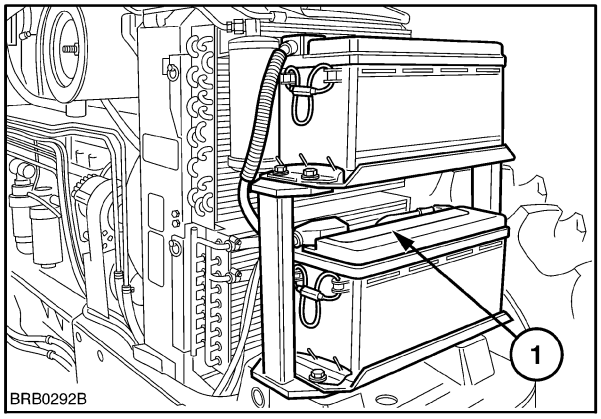
Unscrew and remove the six vent plugs (1) from the top of the battery.



54

Dual Batteries - Figure 55

Use a screwdriver to lever the cover (1) from the top of both batteries and expose the vent holes.



55

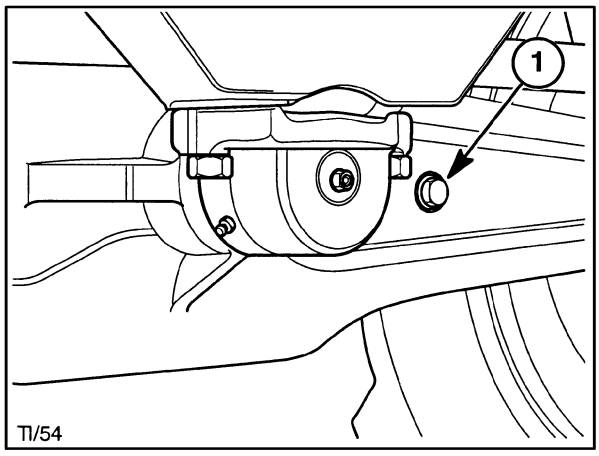
All Batteries

Check that the electrolyte level is above the top of the separator plates in each cell.

If necessary, top up with distilled or de-mineralised water until the level is correct. Do not overfill. Never use tap water or water from a rain barrel or other source.

To prevent the formation of verdigris (corrosion) the terminals should be cleaned and lightly coated with petroleum jelly (Vaseline or similar).

IMPORTANT: *In the event of the batteries being severely discharged, such that terminal voltage is below 7 volts, recovery will require a special charging procedure. See your authorised dealer.*



56

OPERATION 17
FOUR WHEEL DRIVE LUBRICATION

Front Axle - Figure 56

Remove the combined level/filler plug (1) Figure 56 and ensure that the oil reaches the bottom of the opening. If necessary, top up through the opening with clean oil and replace the plug.

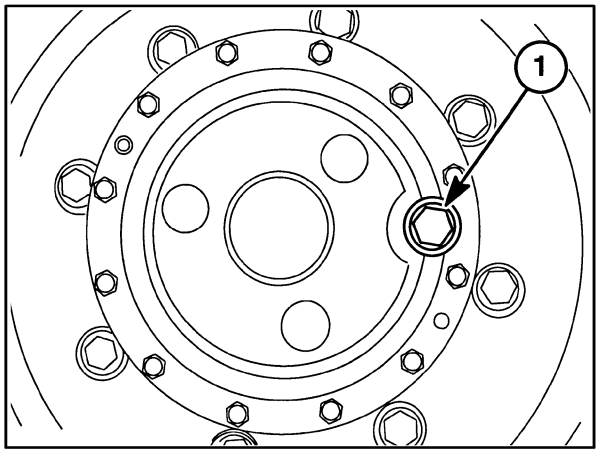
Front Hub - Figures 57

Position a front wheel with the combined level/filler plug (1) at the 3 o'clock position, as shown.

Remove the level/filler plug and ensure that the oil reaches the bottom of the opening. If necessary, top up through the opening with clean oil until oil just overflows from the opening. Re-install the plug.

Repeat on the other front wheel.

See section 8 for the correct oil specification.



57

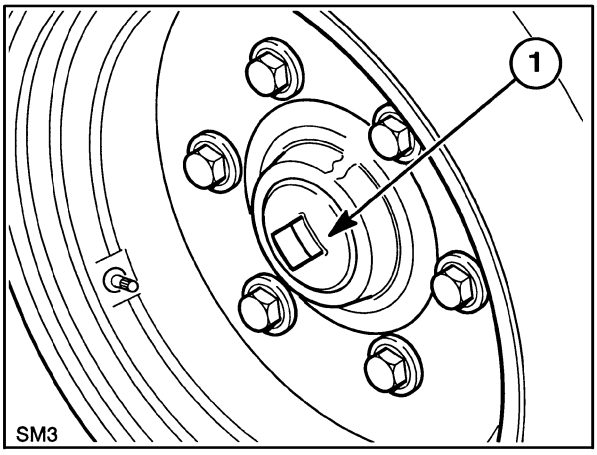
OPERATION 18
GREASE THE FRONT WHEEL BEARINGS (2 wheel drive only) - Figure 58

Remove the centre cap (1) Figure 58. Pack the cap with fresh grease and re-install.

Repeat on the opposite wheel.

NOTE: *Grease more frequently when operating in very wet, muddy or extremely dusty conditions.*

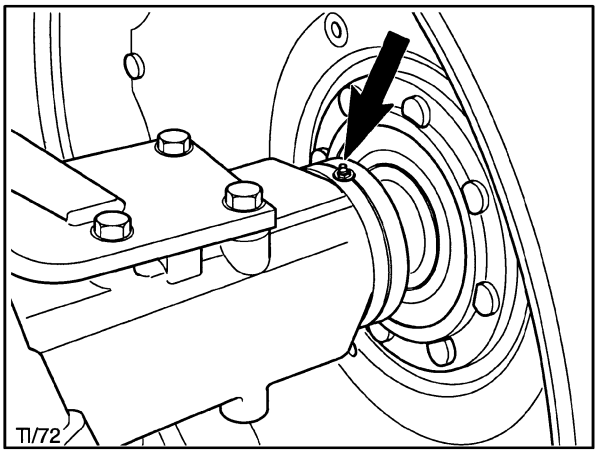
See section 8 for the correct grease specification.



58

OPERATION 19
GREASE THE REAR AXLE SHAFTS
– Figure 59

Apply two strokes only of the grease gun to the grease fitting installed at both ends of the axle shaft.



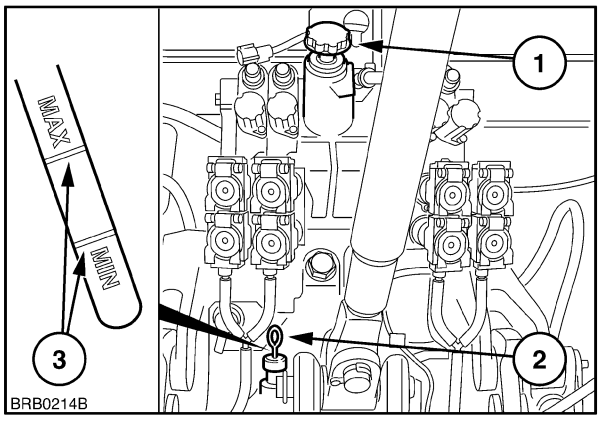
59

NOTE: *Grease more frequently when operating in very wet, muddy or extremely dusty conditions.*

See section 8 for the correct grease specification.

OPERATION 20
CHECK TRANSMISSION/REAR AXLE/-HYDRAULICS OIL LEVEL – Figure 60

Check the oil level with the tractor parked on a level surface, with all cylinders extended and the engine shut off for at least five minutes.



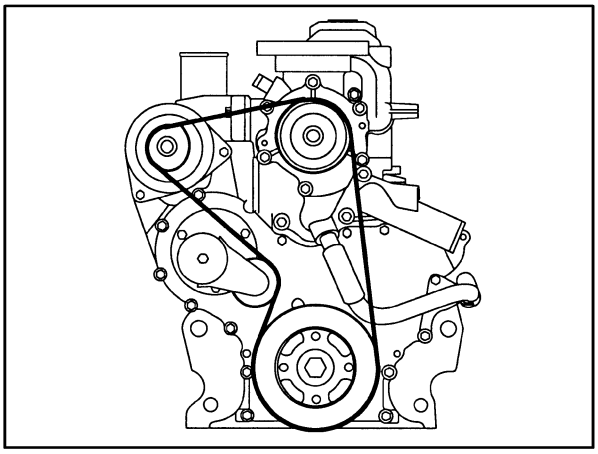
60

Remove the dipstick (2) Figure 60 and check that the oil level is between the 'MIN' and 'MAX' marks (3). If the oil level is low, remove the filler cap (1) and add oil, as required.

See section 8 for the correct oil specification.

OPERATION 21
INSPECT POLY V-BELT - Figures 61 and 62

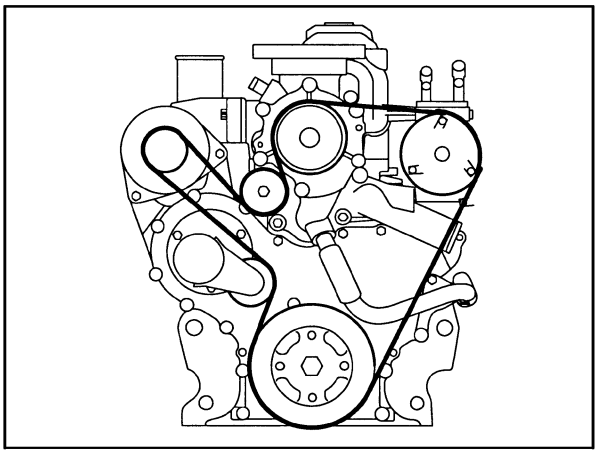
The Poly V-belt is shown in Figures 61 and 62. In Figure 61, the belt run is shown on a tractor without air conditioner. In Figure 62, the belt run is shown on a tractor with air conditioner.



61

Inspect the belt over it's entire length, checking for chafing, cracking, cuts and general wear. If in doubt, install a new belt.

Ensure that the belt is correctly located on the pulleys and check that the belt tensioner is operating correctly.

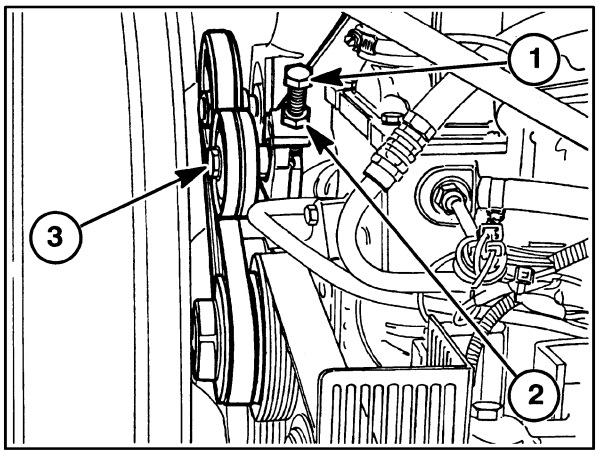


62

OPERATION 22
COMPRESSOR DRIVE BELT TENSION (Air operated trailer brakes - where fitted)
- Figure 63

The drive belt is tensioned by moving the idler pulley. Loosen the idler pulley pivot bolt (3) and retighten to 6 Nm (55 lbf. in.) This low torque is just sufficient to pinch the idler pulley assembly against it's bracket. Loosen the locknut (2) and check the torque of the tensioner bolt (1). The correct torque is 7.5 Nm (66 lbf.in.). Adjust torque, as necessary and tighten the locknut.

Retighten the pulley pivot bolt (3) to 85 Nm (62 lbf.ft.).



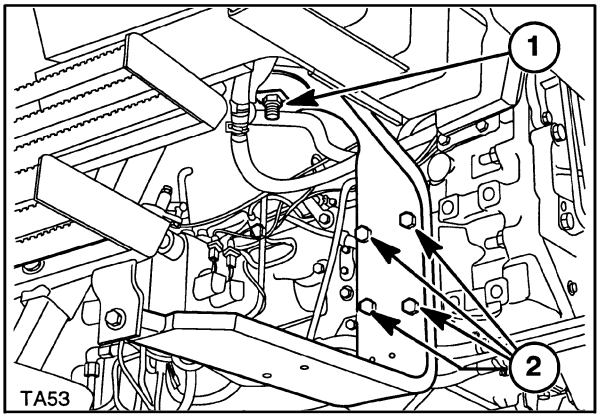
63

OPERATION 23
CHECK SAFETY CAB MOUNTING BOLTS AND NUTS - Figures 64 to 67

Check the torque of the safety cab mounting bolts:

Cab Front Mounts (all models with standard or suspended cab) - Figure 64
The front mounting nuts are accessible from beneath the cab and are located on both sides, at the front. Torque the nuts/bolts as follows:

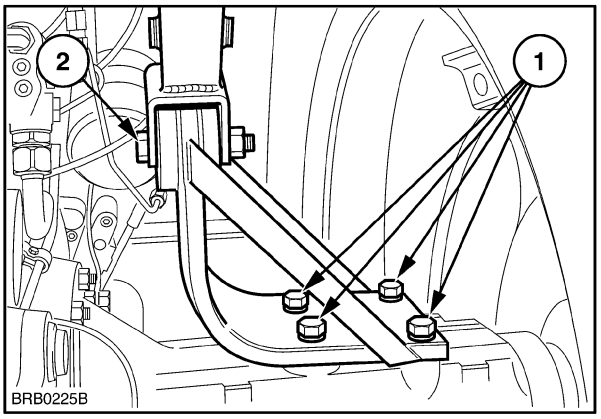
(1) Cab mount isolator nut: (one each side)	340 - 420 Nm (250 - 309 lbf. ft.)
(2) Mounting bracket to transmission bolts: (four each side)	114 - 148 Nm (84 - 109 lbf. ft.)



64

Cab Rear Mounts (TM115, TM125, TM135 and TM150 tractors with standard cab) - Figure 65
The rear mounts are accessible from beneath the cab and are located on both sides, at the rear. Torque the nuts/bolts as follows:

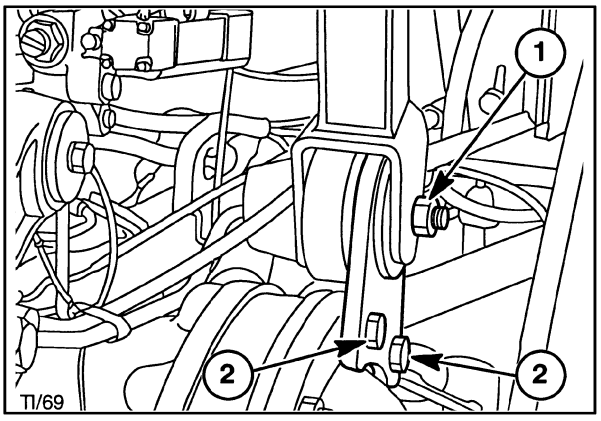
(1) Mounting bracket to axle bolts: (four each side)	289 - 319 Nm (213 - 235 lbf. ft.)
(2) Cab mount isolator nut: (one each side):	340 - 420 Nm (250 - 309 lbf. ft.)



65

Cab Rear Mounts (TM165 tractors with standard cab) - Figure 66
The rear mounts are accessible from beneath the cab and are located on both sides, at the rear. Torque the nuts/bolts as follows:

(1) Cab mount isolator nut: (one each side)	380 Nm (280 lbf. ft.)
(2) Mounting bracket to axle housing bolts: (two each side)	250 - 309 Nm (184 - 228 lbf. ft.)

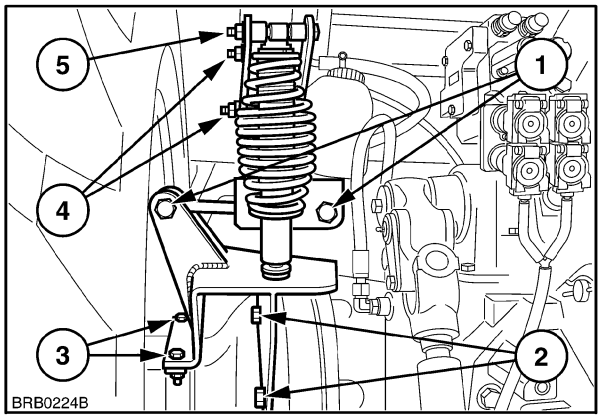


66

Cab Rear Mounting Bolts and Nuts (tractors with suspended cab) - Figure 67

The rear mounts are accessible from beneath the cab and are located on both sides, at the rear. Torque the nuts/bolts as follows:

(1)	Stabiliser rod nuts: (two nuts, left-hand side only)	200 Nm (147 lbf. ft.)
(2)	Mounting bracket to axle housing bolts: (three each side)	145 Nm (107 lbf. ft.) (except TM165) 215 Nm (158 lbf. ft.) (TM165 only)
(3)	Mounting bracket to axle bolts: (two each side)	310 Nm (228 lbf. ft.) (except TM165) 85 Nm (62 lbf. ft.) (TM165 only)
(4)	Upper mounting bracket nuts (two each side)	50 Nm (37 lbf. ft.)
(5)	Suspension strut upper mounting nut (one each side)	215 Nm (158 lbf. ft.)



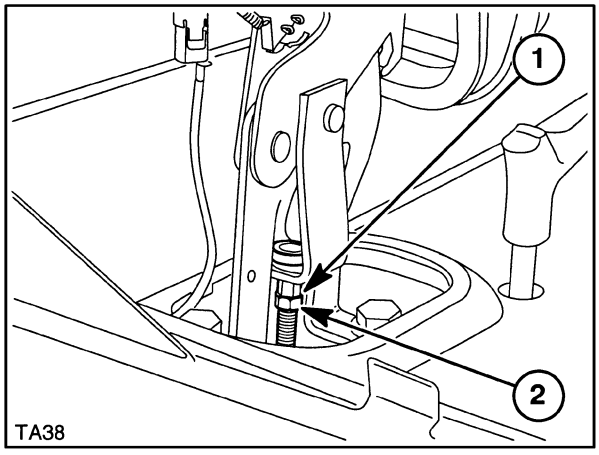
67

OPERATION 24
ADJUST PARKING BRAKE - Figure 68

Block the front wheels, jack up the rear of the tractor and support the rear wheels just clear of the ground.

Apply the handbrake so that the 4th. notch of the sector is engaged. Loosen the locknut (2) and turn the adjuster nut (1) on the operating cable until the wheels start to lock. Release the handbrake and ensure that both wheels are free to rotate. Apply the handbrake to ensure that the system operates freely. Tighten the locknut.

Road test, using the handbrake to stop the tractor.



68

EVERY 600 HOURS carry out the preceding checks plus the following:

OPERATION 25
CHANGE HYDRAULIC AND TRANSMISSION OIL FILTERS - Figures 69 and 70

The type of hydraulic filters is dependent upon tractor specification. All the filters are installed under the right-hand side of the floor.

The main filter (1) Figure 69 and the charge filter (2) are installed only on tractors with variable displacement pump (CCLS system).

Figure 70 shows the main hydraulic filter (1) on tractors with fixed displacement hydraulic pump. The filter (2) is installed only on tractors with Dual Command transmission.

All filters, except (1) Figure 70, are of the disposable type. To change a disposable filter, clean the area around the filter, then unscrew and discard it.

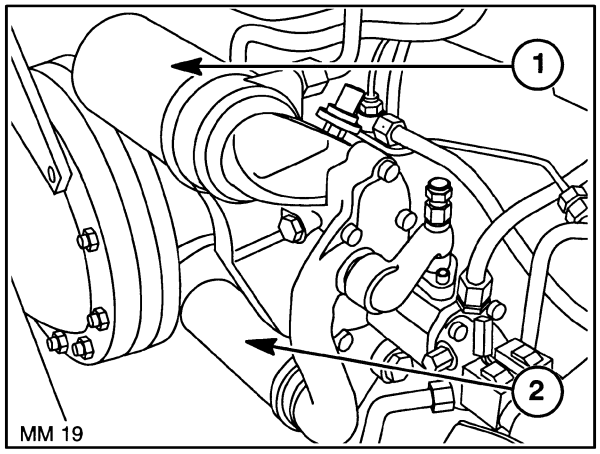
NOTE: *'Crack' open the filter (1) Figure 69 and allow to stand for a few moments before removing fully. This will allow air into the filter so that most of the oil can drain back into the hydraulic system.*

Clean the inlet channel and the face of the filter mounting. Smear clean oil around the rubber seal of each new filter and install on the tractor.

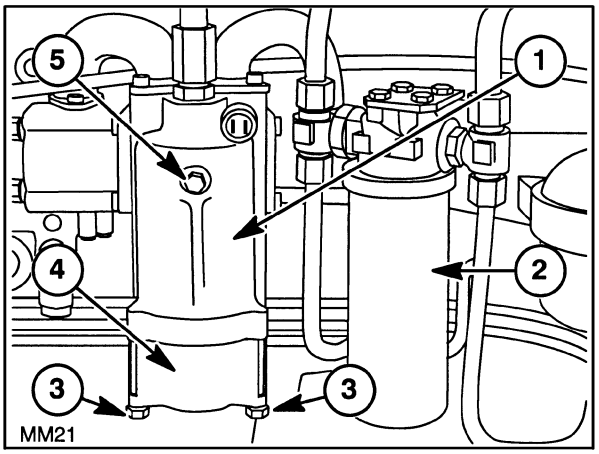
Screw up until the faces just meet, then tighten a further $^{3}/_{4}$ of a turn. Do not overtighten.

Filter (1) Figure 70, has a replaceable paper cartridge. To change the cartridge, loosen the bleed screw (5). This will allow air into the filter body so that the oil can drain back into the hydraulic system.

Remove the screws (3), take off the lower cover (4) and extract the paper element. Install a new cartridge and re-assemble in reverse order to disassembly. Tighten the bleed screw.



69

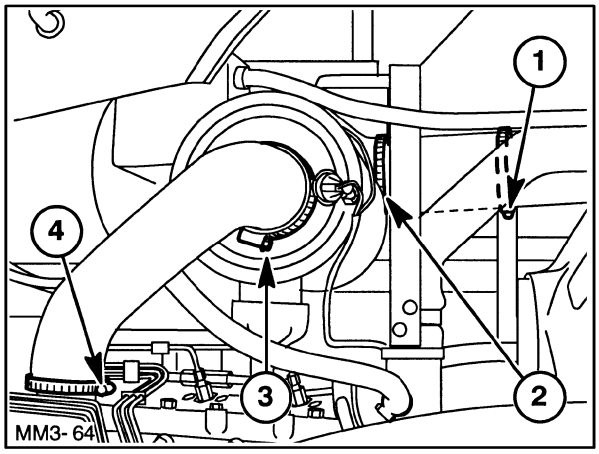


70

OPERATION 26
CHANGE THE ENGINE AIR CLEANER OUTER ELEMENT

Remove the outer element, as described in operation 1 and discard it.

Clean the inside of the air cleaner casing using a damp, lint-free cloth on a probe, taking care not to damage the inner element. Install a new outer element.

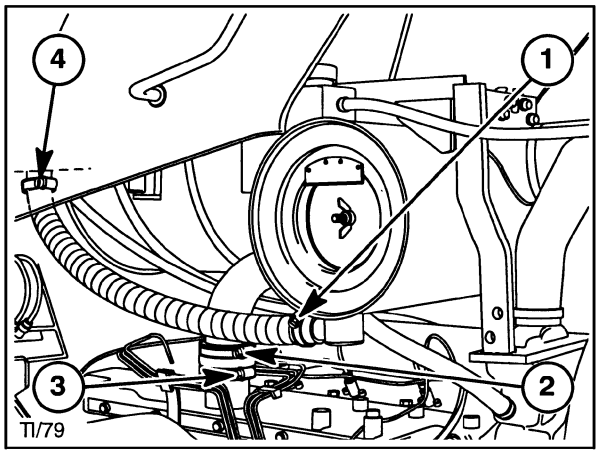


71

OPERATION 27
CHECK ENGINE AIR INTAKE CONNECTIONS
- Figures 71 to 73

TM115, TM125 and TM135 models - Figure 71

Working from both sides of the engine, as necessary, check all intake system connections at points (1), (2), (3) and (4) for proper sealing and the hose clamps for tightness.



72

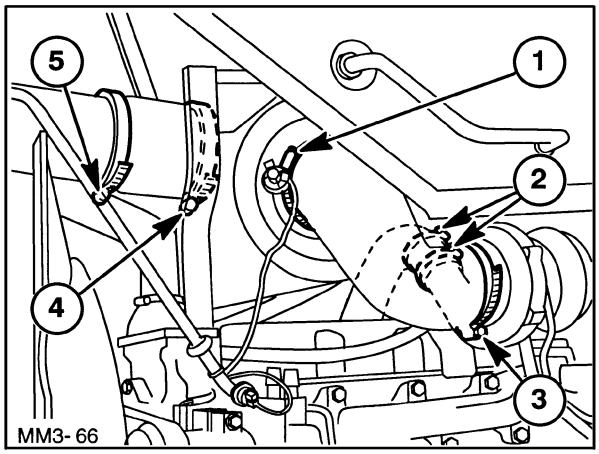
TM150 and TM165 models - Figure 72

From the right-hand side of the engine, check the exhaust aspirator connections at points (1) and (4) and the two hose clamps (2) and (3) on the turbocharger to inlet manifold connection for proper sealing and the clamps for tightness.

NOTE: *An exhaust aspirator is also available as an option on TM115, TM125 and TM135 models.*

TM150 and TM165 models - Figure 73

From the left-hand side of the engine, check the air cleaner intake connections at points (4) and (5) and the air cleaner to turbocharger connections at points (1) and (3). It is essential that the clean air side of the filtration system is sealing correctly at the connections (1) and (3).



73

There are also two hose clamps (2) on the turbo-charger to inlet manifold tube at the turbocharger end.

OPERATION 28
CHECK ENGINE VALVE CLEARANCE
– Figures 74 and 75

Check the valve clearance with the engine cold.

The correct valve clearance is:

Inlet	0.014 - 0.018 in. (0.36 - 0.46 mm)
Exhaust	0.017 - 0.021 in. (0.43 - 0.53 mm)

Remove the rocker cover ventilation tube (3) Figure 74, which is fastened to the left-hand side of the block by two screws. Remove the 14 screws (2) securing the rocker cover (1) to the cylinder head.

NOTE: *On TM150 and TM165 tractors, it may be necessary to remove the air cleaner assembly and coolant recovery tank before the rocker cover can be lifted.*

Adjust valve clearance as follows:

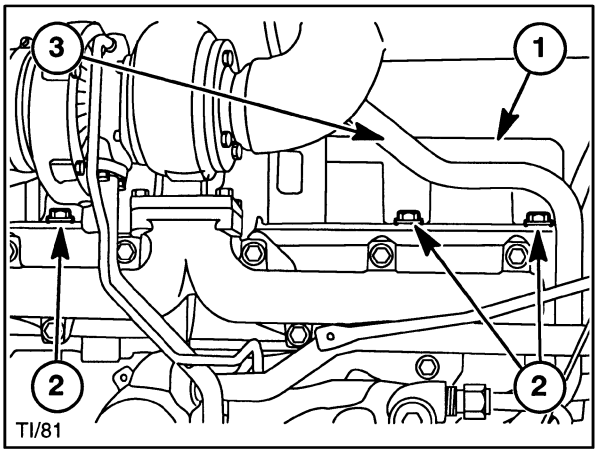
1. Turn the crankshaft until any pair of valves in the 'Valves Open' column is fully open. Check and adjust the corresponding pairs of valves in the 'Valves to Adjust' column.

Valves Open	Valves to Adjust
1 inlet/3 exhaust	4 exhaust/6 inlet
5 inlet/6 exhaust	1 exhaust/2 inlet
2 exhaust/3 inlet	4 inlet/5 exhaust
4 exhaust/6 inlet	1 inlet/3 exhaust
1 exhaust/2 inlet	5 inlet/6 exhaust
4 inlet/5 exhaust	2 exhaust/3 inlet

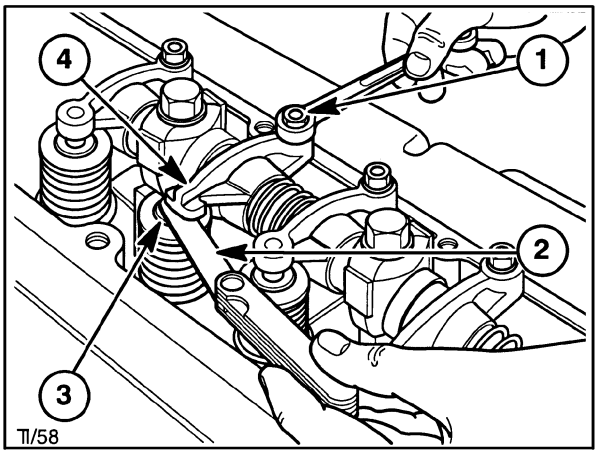
2. Slide a feeler gauge (2) Figure 75, of the correct thickness between the valve stem (3) and rocker arm (4).

3. Turn the rocker arm adjusting screw (1) until the correct clearance is obtained. Turn the screw clockwise to reduce clearance and anti-clockwise to increase clearance.

4. Repeat the process until all the valves have been checked and adjusted.



74



75

OPERATION 29
CHANGE SECONDARY FUEL FILTER ELEMENT (FRONT) - Figures 76 and 77

IMPORTANT: *Before loosening or disconnecting any part of the fuel injection system, thoroughly clean the area to be worked on to prevent contamination.*

Drain the fuel filter and sedimenter assembly, as follows:

1. Loosen the bleed screw (1) Figure 76, on the front filter assembly.

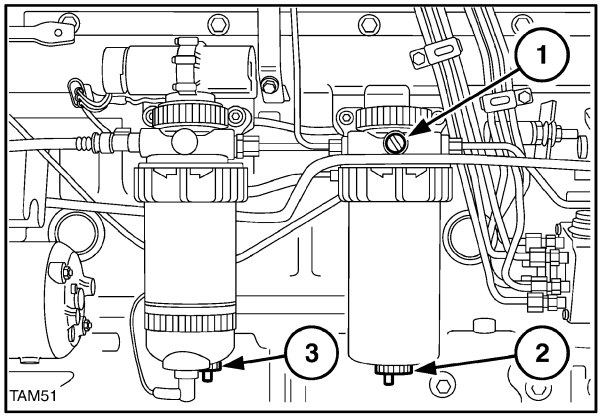
2. Open the drain plugs on the sedimenter and filter by loosening the knobs (2) and (3). Allow the fuel to drain out. Catch the fuel in a suitable container and dispose of properly.

3. The retaining ring (1) Figure 77, has quick start thread. Unscrew the retaining ring, remove the filter (2) and dispose of properly.

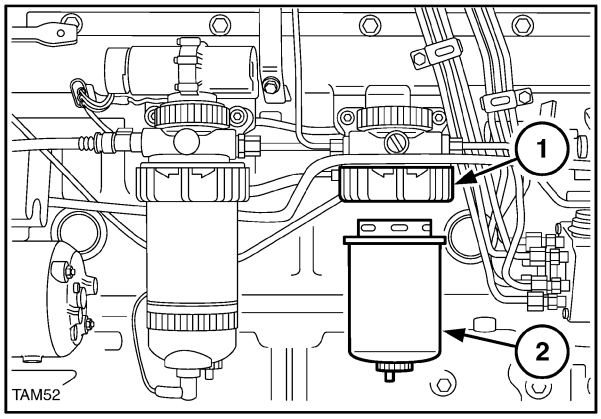
4. Install a new filter and secure with the retaining ring. Close both drain plugs.

5. With the bleed screw open (1) Figure 78, turn on the key-start switch to actuate the electric fuel pump and bleed the filter. When fuel, free of air bubbles is emitted from the filter bleed screw hole, tighten the bleed screw and turn the key-start switch off.

NOTE: *There is no requirement to change the primary (rear) filter at this service. See Operation 30.*



76



77

EVERY 1200 HOURS or 12 MONTHS (whichever occurs first)

carry out the preceding checks plus the following:

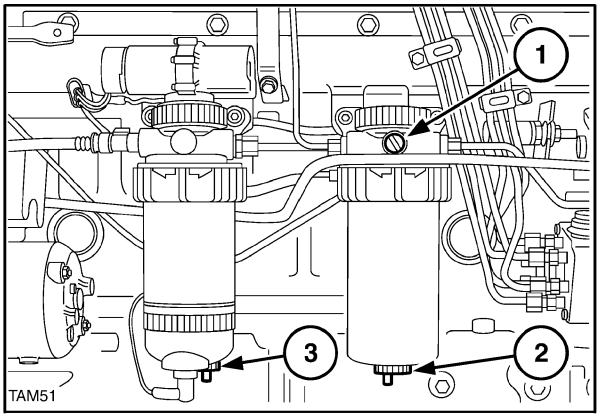
OPERATION 30
CHANGE PRIMARY FUEL FILTER (REAR) ELEMENT – Figures 78 and 79

IMPORTANT: *Before loosening or disconnecting any part of the fuel injection system, thoroughly clean the area to be worked on to prevent contamination.*

Figure 78

1. Loosen the bleed screw (1) on the secondary filter assembly.

2. Open the drain plugs on the sedimenter and filter by loosening the knobs (2) and (3). Allow the fuel to drain out. Catch the fuel in a suitable container and dispose of properly.



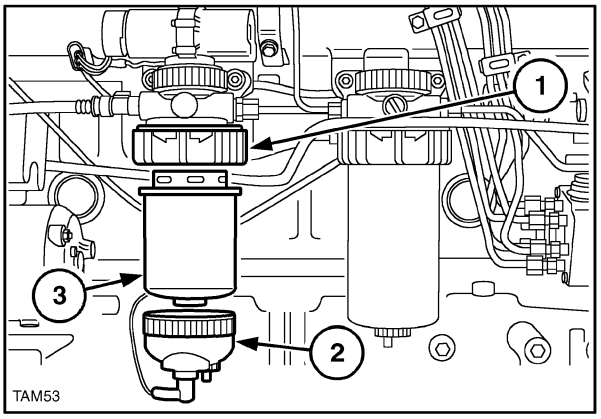
78

Figure 79

3. Unscrew and remove the bowl/ring assembly (2) from the sedimenter.

4. The retaining ring (1) has quick start thread. Unscrew the retaining ring, remove the filter (3) and dispose of properly.

5. Install a new filter and the bowl/ring assembly.



79

6. Bleed the system as in step 5, Operation 29.

OPERATION 31
CHANGE CAB AIR FILTERS

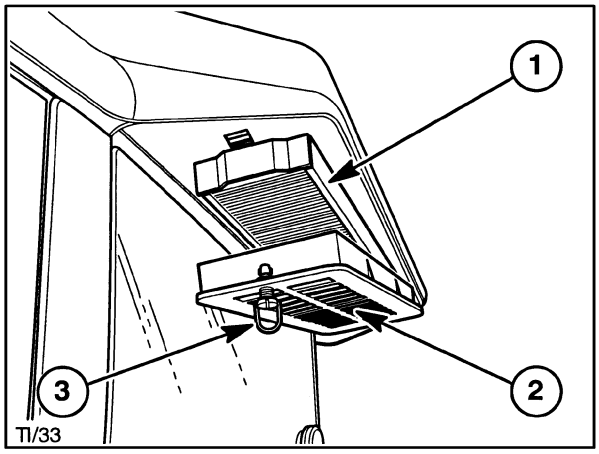
External Filters - Figure 80

To remove an external filter, turn the quick release fastener (3) $^{1}/_{2}$ a turn anti-clockwise to free the front of the filter cover (2). Remove the cover (2) and filter element (1). Dispose of the filter elements properly.

Clean both filter chambers with a damp, lint-free cloth.

Install new filter elements. A flow direction arrow is moulded into the side of the filter. Install the filters with the arrow pointing upwards. Re-install the covers.

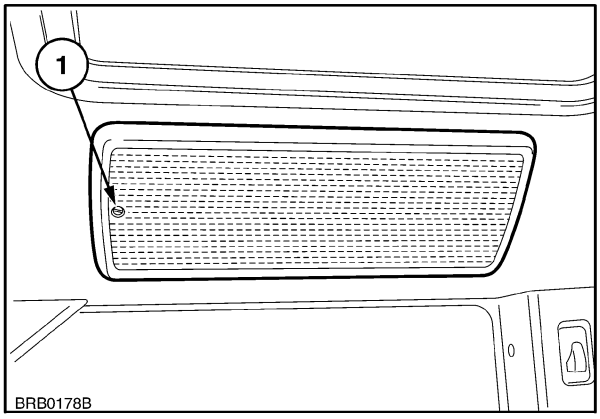
NOTE: *The filters are made of specially treated media with a rubber sealing strip bonded around the sides. Take care not to damage the element during installation.*



80

Internal Filters - Figure 81

To remove an internal filter, turn the captive screw (1) anti-clockwise and remove the filter cover.



81

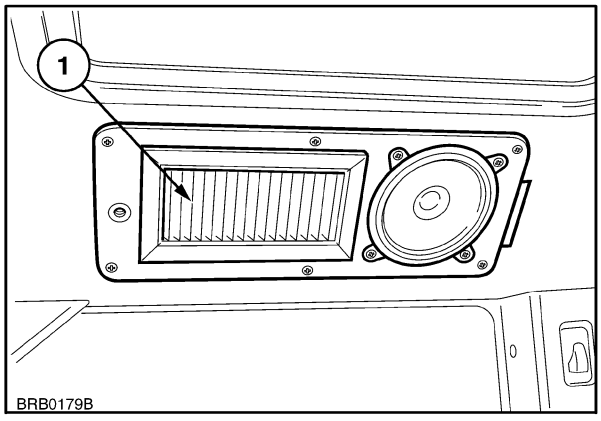
Figure 82

Remove the filter (1) from it's housing. Dispose of the filter elements properly.

Clean both filter chambers with a damp, lint-free cloth.

Install new filter elements (with the rubber seal down) and re-install the covers.

NOTE: *The filters are made of specially treated media with a rubber sealing strip bonded to the lower surface. Take care not to damage the elements during installation.*



82

OPERATION 32
CHANGE TRANSMISSION/REAR AXLE/HYDRAULIC OIL AND FILTERS - Figures 83 and 84

Prior to changing the oil, run the engine and operate the hydraulic system until the oil is warm. Park the tractor on level ground, lower the three-point linkage and stop the engine. Engage the parking brake and block wheels on both sides.

⚠ WARNING ⚠

Be very careful to avoid contact with hot oil. If oil is extremely hot, allow it to cool to a moderately warm temperature before proceeding.

To change the oil:

1. Remove the drain plug (1) Figure 83 (Dual Command transmission shown) and completely drain all oil into a suitable container. Dispose of the oil properly.

2. Re-install the drain plug after the oil has drained.

IMPORTANT: *Perform operation 25 (change hydraulic and transmission filters) before refilling with oil.*

3. Remove the filler plug cap (1) Figure 84 and refill with new oil.

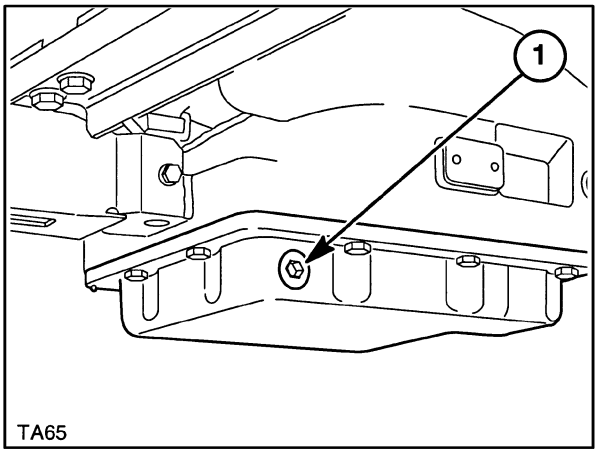
4. Run the engine and operate the hydraulic system. Fully raise the three-point linkage.

5. Stop the engine and wait five minutes while checking the system for leaks.

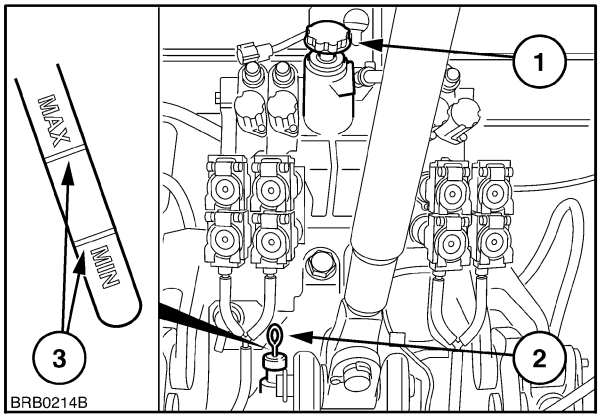
6. Check the oil level by means of the dipstick (2). Add oil as required until the oil level is between the 'MIN' and 'MAX' marks (3).

NOTE: *Do not fill above the full mark.*

See section 8 for the correct oil specification.



83



84

Oil Capacity:
TM115/125 with Synchro Command transmission & open centre hydraulics : 65 litres
(14.3 Imp. gal.) (17.2 U.S. gal.)

TM115/125 with Dual Command transmission & open centre hydraulics: 63 litres
(13.9 Imp. gal.) (17.2 U.S. gal.)

TM115/125/135 with Dual Command transmission & CCLS hydraulics : 73 litres
(16.1 Imp. gal.) (19.3 U.S. gal.)

TM115/125/135 with Range Command transmission & CCLS hydraulics: 90 litres
(19.8 Imp. gal.) (23.8 U.S. gal.)

TM150 with Power Command or Range Command transmission & CCLS hydraulics: 90 litres
(19.8 Imp gal.) (23.8 U.S. gal.)

TM165 with Power Command or Range Command transmission & CCLS hydraulics: 100 litres
(22.0 Imp gal.) (26.4 U.S. gal.)

OPERATION 33
CHANGE 4WD DIFFERENTIAL OIL
- Figures 85 and 86

Park the tractor on level ground and engage the park brake.

To change the oil:

1. Remove the drain plug (1) Figure 85 and completely drain all oil into a suitable container. Dispose of the oil properly.

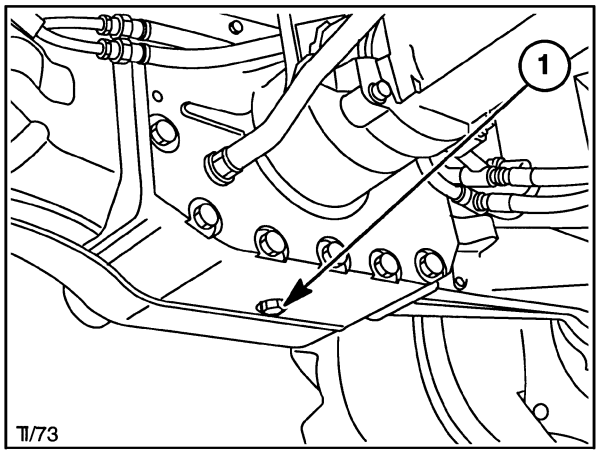
2. Re-install the drain plug. Remove the level/filler plug (1) Figure 86.

3. Fill with new oil until it reaches the bottom of the level/filler plug hole. Re-install level/filler plug.

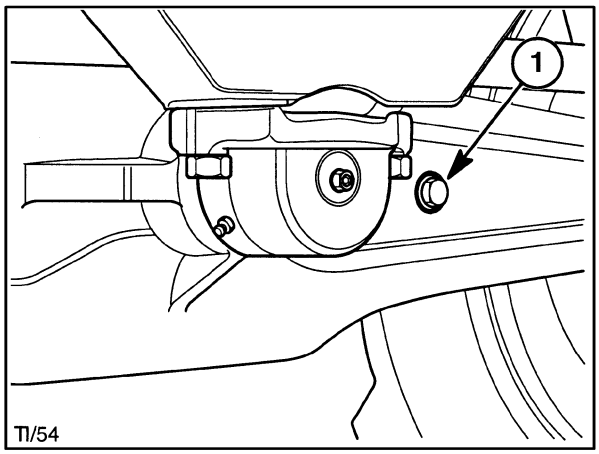
See section 8 for the correct oil specification.

Oil Capacity:
TM115, TM125 and TM135 9.0 litres
(15.8 Imp. pints) (9.5 U.S. qts.)

TM150 and TM165 14 litres
(24.6 Imp. pints) (14.8 U.S. qts.)

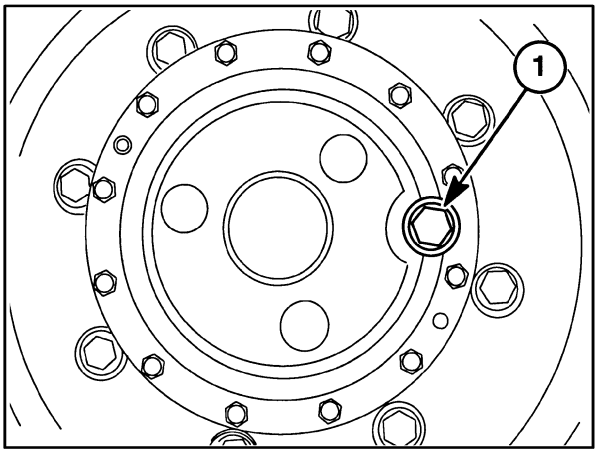


85



86

OPERATION 34
CHANGE 4WD PLANETARY HUB OIL
- Figure 87



87

Park the tractor on level ground and engage the park brake.

To change the oil:

1. Position the wheel so the filler/drain/level plug (1) is at the lowest point. Remove the plug and completely drain all oil into a suitable container. Dispose of the oil properly.

2. Rotate the wheel so that the combined level/filler plug (1) is at the 3 o'clock position, as shown in Figure 87.

3. Refill the hub with new oil until it reaches the bottom of the level/filler plug hole (1). Install the plug.

4. Repeat the process on the other hub.

See section 8 for the correct oil specification.

Oil Capacity (each hub):

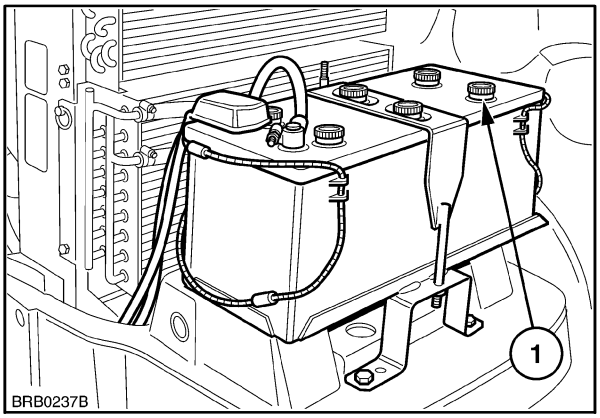
TM115, TM125 and TM135	1.7 litres	
	(3.0 Imp. pints)	(1.8 U.S. qts.)
TM150 and TM165	2.15 litres	
	(3.8 Imp. pints)	(2.3 U.S. qts.)

OPERATION 35
BATTERIES

IMPORTANT: *This operation applies only to batteries on tractors operating in* ***temperate*** *climates. Tractors operating in tropical climates should have the battery electrolyte level checked every 300 hours. See operation 16.*

Single Battery - Figure 88

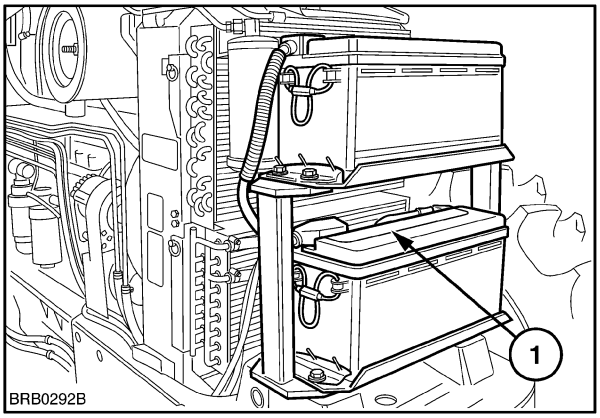
Unscrew and remove the six vent plugs (1) from the top of the battery.



88

Dual Batteries - Figure 89

Use a screwdriver to lever the cover (1) from the top of both batteries and expose the vent holes.



89

All Batteries

Check that the electrolyte level is above the top of the separator plates in each cell.

If necessary, top up with distilled or de-mineralised water until the level is correct. Do not overfill. Never use tap water or water from a rain barrel or other source.

To prevent the formation of verdigris (corrosion) the terminals should be cleaned and lightly coated with petroleum jelly (Vaseline or similar).

IMPORTANT: *In the event that the batteries become severely discharged, such that terminal voltage is below 7 volts, recovery will require a special charging procedure. See your authorised dealer.*

EVERY 1200 HOURS or 2 YEARS (whichever occurs first) carry out the preceding checks plus the following:

OPERATION 36
COOLING SYSTEM - Figures 90 to 95

During manufacture, the engine cooling system is filled with a high quality antifreeze and water solution. The antifreeze contains a chemical inhibitor. This inhibitor increases and extends the protection offered by conventional antifreezes.

The inhibitor will:

- Increase rust prevention.
- Reduce scale formation.
- Minimise cylinder wall erosion (pitting).
- Reduce foaming of the coolant.

The chemical inhibitor must be replenished, at intervals, to maintain the optimum protection level. This protection is provided by draining and flushing the system and refilling with a 50% solution of Ambra Agriflu antifreeze or, where this antifreeze is not available, with a measured dosage of chemical inhibitor. See the following text.

Draining and Refilling the Cooling System

WARNING

The cooling system operates under pressure which is controlled by the pressure cap on the coolant expansion tank. It is dangerous to remove the pressure cap while the system is hot. When cool, use a thick cloth and turn the cap slowly to the first stop and allow the pressure to escape before fully removing the cap. Coolant should be kept off the skin. Adhere to the precautions outlined on the antifreeze and inhibitor containers, where used.

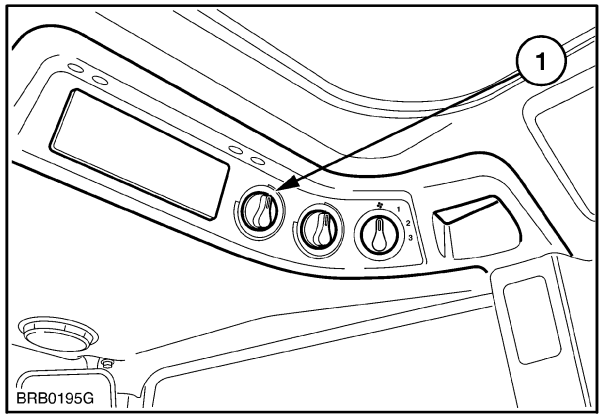
IMPORTANT: *It is essential that an approved pressure cap is used. If the cap is mislaid or damaged, obtain a replacement from your New Holland dealer.*

CAUTION

Allow the engine to cool before draining the coolant.

WARNING

Coolant should be kept off the skin. Adhere to the precautions outlined on the antifreeze container.

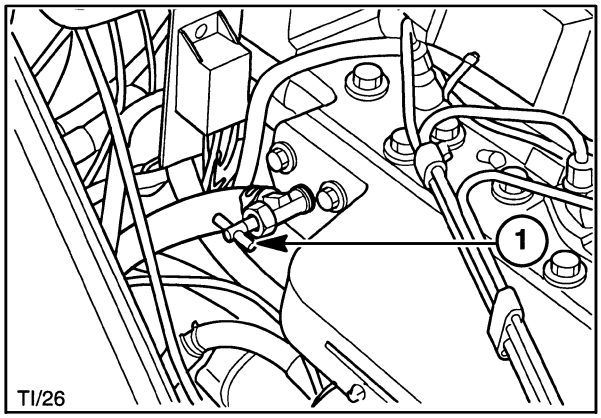


90

1. Turn the heater control knob (1) Figure 90 to the maximum heat position (fully clockwise).

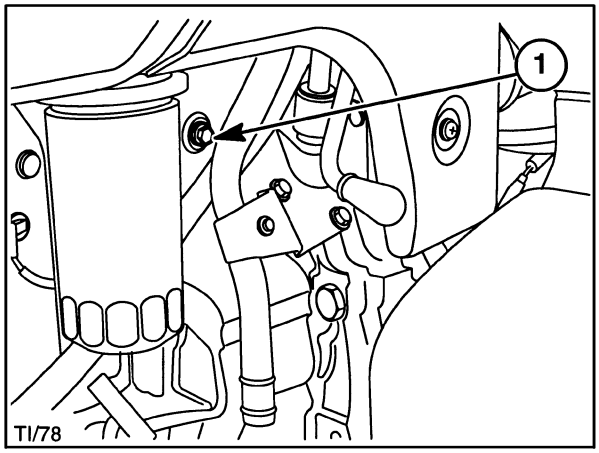
2. Check that the heater shutoff valve (1) Figure 91 is open. This valve is on the rear, right-hand side of the engine cylinder head.

3. Disconnect the radiator lower hose and drain all the coolant into a suitable container. Dispose of the coolant properly.



91

4. Remove the coolant drain plug (1) Figure 92 from the left-hand rear of the engine block. Drain all the coolant into a suitable container. Dispose of the coolant properly.

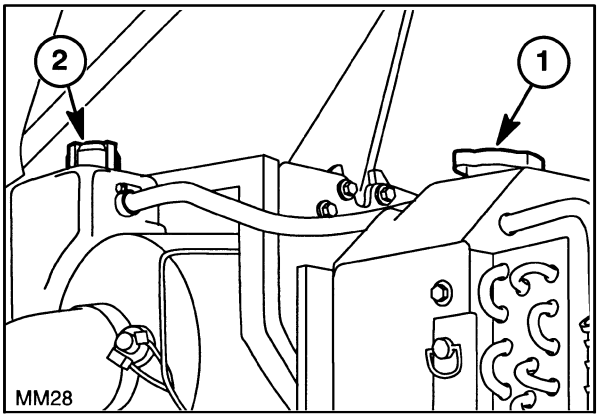


92

5. To increase the drainage rate, remove the radiator cap (1) Figure 93 and recovery tank cap (2).

6. Flush the system with a commercial cooling system cleaner. Follow the instructions supplied with the cleaner. Drain the cleaner and let the engine cool.

IMPORTANT: *Never put cold coolant in a hot engine. The difference in temperature could cause the block or head to crack.*



93

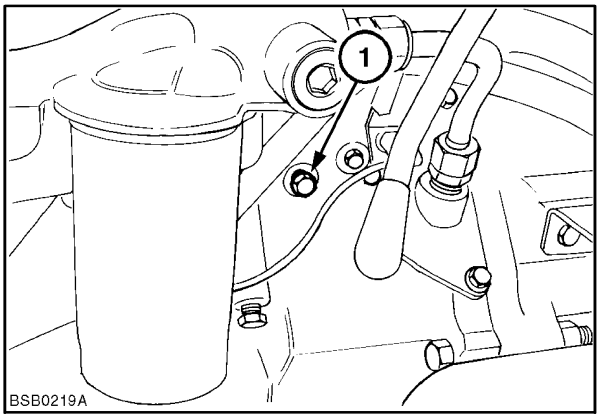
7. Re-install the engine coolant drain plug (1) Figure 94 and the radiator lower hose.

8. Fill the system with clean water and run the engine for 10 minutes, then drain all the water. Allow the engine to cool.

9. Fill the cooling system with a 50/50 blend of antifreeze and clean, soft water. Add coolant slowly through the radiator filler neck until the coolant is to the bottom of the filler neck.

NOTE: *To avoid trapping air in the system, fill the radiator as slowly as practicable thereby allowing any air pockets to disperse.*

The coolant to be used is dependent upon local availability. See the following text:



94

Using Ambra Agriflu Antifreeze (NH 900 A)
Use a solution of 50% clean water and 50% antifreeze. The inhibitor already in this antifreeze is sufficient to protect your engine for a further 1200 hours or two years, whichever occurs first.

Using a Proprietary Antifreeze
Where antifreeze meeting the above-mentioned specification is not available, use a proprietary, heavy duty antifreeze premixed with 5% chemical inhibitor. The inhibitor is available from your New Holland dealer and is supplied in 16 fl. oz. (473 ml) bottles, the side of the bottle being marked in 1 fl. oz. increments.

⚠ WARNING ⚠

Inhibitor solution is irritating to eyes and skin. It contains buffered potassium hydroxide.

- *Avoid contact with eyes or prolonged and repeated skin contact.*
- *Wear protective eyewear when using.*
- *In case of contact with eyes, flush with water for 15 minutes and obtain medical attention.*
- *Wash skin with soap and water after use.*
- *Keep out of reach of children.*

Mix **three** complete bottles of inhibitor with 14 litres (3.1 Imp. gal.) (3.7 U.S. gal.) of clean water and 14 litres (3.1 Imp. gal.) (3.7 U.S. gal.) of antifreeze. Any excess coolant should be kept in a specially marked container and used for top up purposes.

Using Plain Water

If you reside in a country where antifreeze is not available, use clean water premixed with 5% chemical inhibitor. The inhibitor is available from your New Holland dealer and is supplied in 16 fl. oz. (473 ml) bottles, the side of the bottle being marked in 1 fl. oz. increments.

Mix **three** complete bottles of inhibitor with 28.5 litres (6.25 Imp. gal.) (7.5 U.S. gal.) of clean water. This will provide more coolant mixture than is actually required. The excess coolant should be kept in a specially marked container and used for top up purposes.

After Refilling the System - All Coolant Solutions

10. Inspect cooling system hoses and connections for leaks.

11. Fill the coolant recovery tank (1) Figure 95 to the cold fill mark (2).

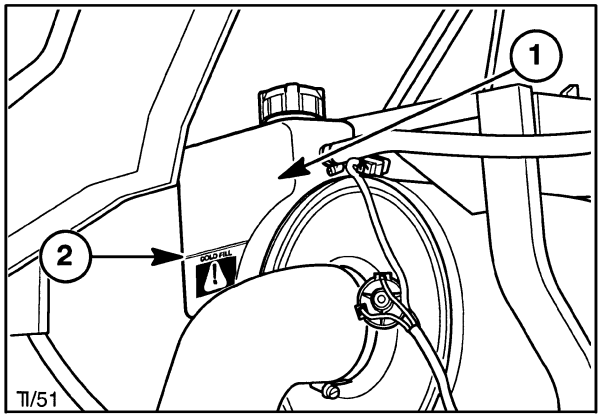
12. Start the engine and run it until normal operating temperature is reached.

NOTE: *The coolant level will drop as coolant is pumped around the system.*

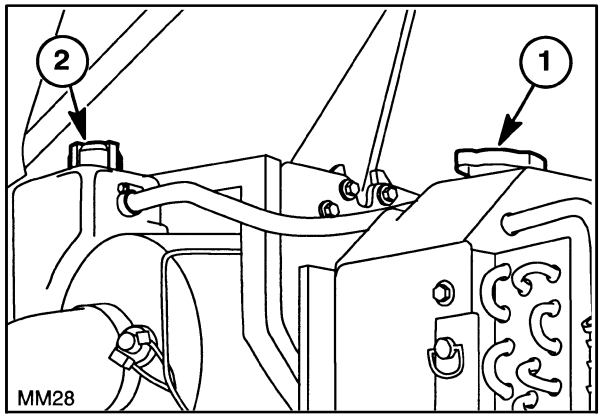
13. Stop the engine and allow the coolant to cool.

14. Remove the radiator cap (1) Figure 96 and add coolant to the radiator to bring the coolant level to the bottom of the filler neck. Install the radiator cap. Add coolant to the recovery tank as required to bring the level up to the cold mark (2).

NOTE: *If the engine is not going to be operated immediately following this coolant change, run the engine for one hour to ensure that the antifreeze and/or chemical inhibitor is dispersed throughout the cooling system. Allow the engine to cool and make a final check to ensure that the coolant level is satisfactory.*



95



96

Antifreeze Specification:

Ambra Agriflu (NH 900 A)

Chemical Inhibitor

There are three part numbers for the inhibitor. The content of each bottle is identical, only the instructions on the label differ, by language:

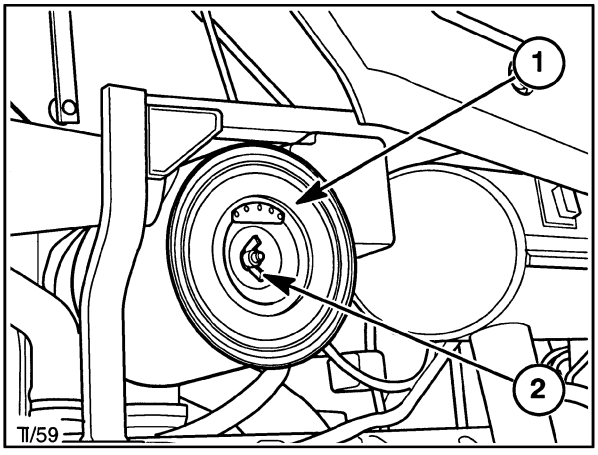
Part No.	Languages on Label
83958743	English, French, Spanish, Portuguese and Greek
83958744	English, French, German, Italian and Dutch
83958745	English, Danish, Norwegian, Finnish and Swedish

Clean Water Specification:

Total Hardness	300 parts per million
Chlorides	100 parts per million
Sulphates	100 parts per million

Coolant Capacity

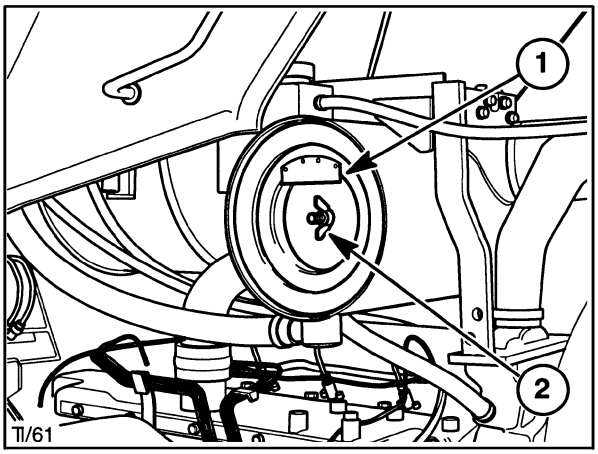
TM115, TM125 and TM135	25.5 litres (5.6 Imp. gallons) (6.7 U.S. gal.)
TM150 and TM165	26.0 litres (5.7 Imp gallons) (6.9 U.S. gal.)



97

OPERATION 37
CHANGE ENGINE AIR CLEANER INNER ELEMENT - Figures 97 to 99

The air cleaner is accessible from the left-hand side on TM115, TM125 and TM135 models (see Figure 97) and from the right-hand side on TM150 and TM165 models (Figure 98).



98

Figure 99 shows the outer element being removed from the right-hand side of a M150 or TM165 model. The removal of the element from other models is similar.

1. Unscrew the wing nut (2) Figure 99, 100 or 101 and remove the outer element (1) from the air cleaner assembly.

NOTE: *Examine the inside of the outer element. If dust is present, the outer element is defective and must be replaced. If it is not necessary to replace the outer element at this service, wash the element as detailed in operation 1, method C.*

2. Unscrew the central securing nut and remove the inner element (3) Figure 99 from the air cleaner assembly.

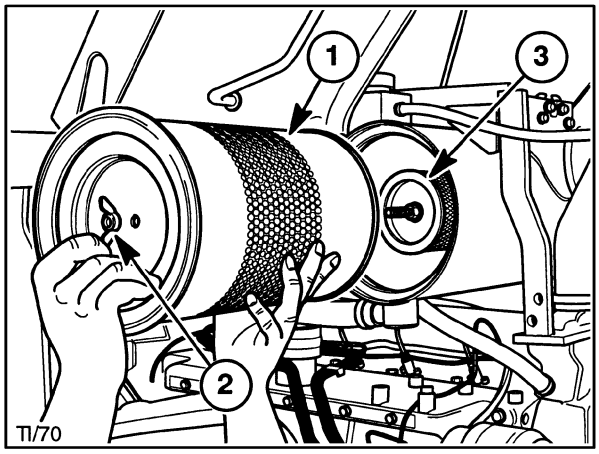
3. Dispose of the inner element properly (and the outer element, if replaced at this service).

4. Clean the inside of the air cleaner housing using a damp, lint-free cloth.

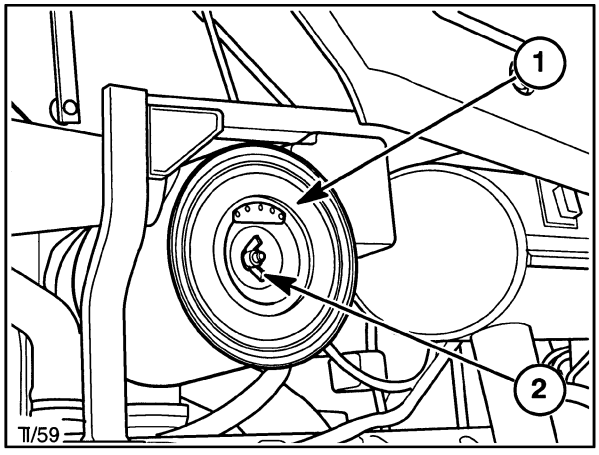
5. Install a new inner element and a cleaned or new outer element. Tighten the wing nut.

NOTE: *Replace the wing nut/seal assembly if it is damaged.*

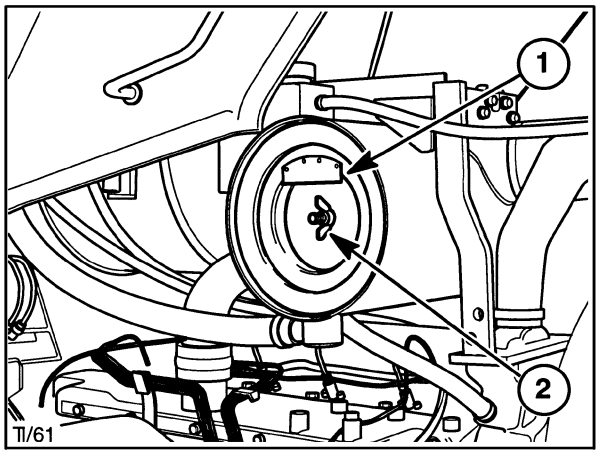
IMPORTANT: *Failure to install the inner filter element properly could result in engine damage. Therefore it is recommended that the element be installed by an authorised dealer.*



99



100



101

EVERY 1800 HOURS carry out the preceding checks plus the following:

OPERATION 38
CLEAN AND RESET FUEL INJECTORS
- Figures 102 to 104

IMPORTANT: *The injectors should be cleaned and adjusted by an authorised dealer or an injector specialist.*

⚠ WARNING ⚠

Diesel fuel escaping under pressure can penetrate the skin causing serious injury.

Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Wear eye protection.

Stop the engine and relieve pressure before connecting or disconnecting lines.

Tighten all connections before starting the engine or pressurising lines.

If any fluid is injected into the skin, obtain medical attention immediately or gangrene may result.

IMPORTANT: *Before loosening or disconnecting any part of the fuel injection system, thoroughly clean the area to be worked on.*

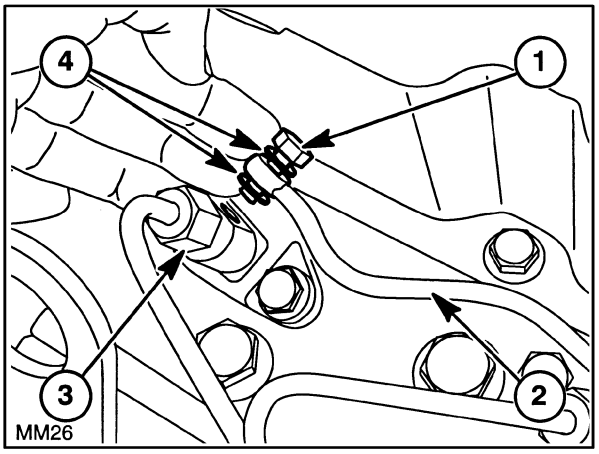
IMPORTANT: *Place caps on all open lines or injector openings to prevent the entry of dirt.*

Use the following procedure to remove and replace the injectors:

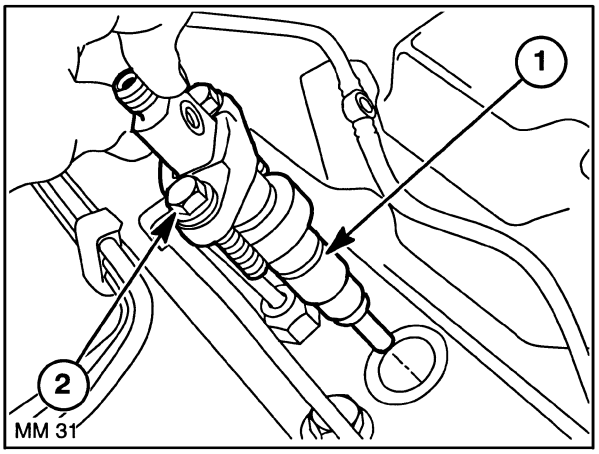
1. Remove the leak off line retaining bolt (1) Figure 102 and the leak off line (2). Discard the two copper washers (4), installed either side of the banjo fitting.

2. Unscrew the nut (3) and disconnect the high pressure injector line from the injector.

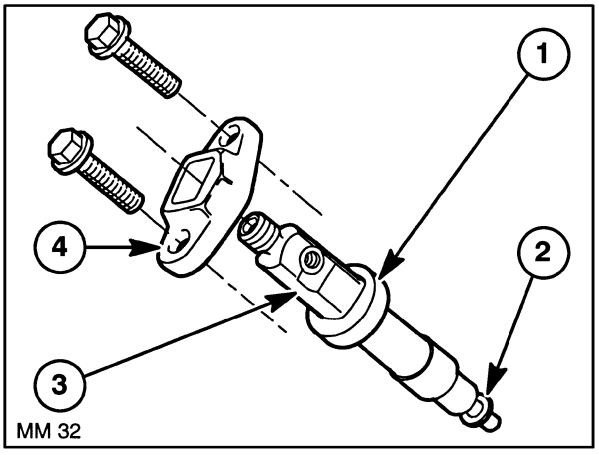
3. Remove the two injector retaining bolts and washers (2) Figure 103. Turn the injector (1) clockwise to loosen it, then remove from the head.



102



103



104

4. Remove the copper sealing washer (2) Figure 104, from the injector (3). If the washer is not on the injector it has remained in the head and must be extracted. Discard the copper washer.

5. Remove and discard the cork dust seal (1) from the injector.

6. Repeat the process on the remaining injectors.

7. The injectors which were removed should be serviced by an authorised dealer.

8. After servicing, install a new cork dust seal (1) Figure 104, on the injector and fit a new copper washer (2) to the end of the injector.

9. Install the injector with the leak-off port (3) Figure 103 facing the valve cover, as shown.

NOTE: *Ensure that the clamp (4) Figure 104, is installed with the raised side uppermost, as shown.*

10. Install the injector retaining bolts and washers. Torque the bolts evenly to 23 Nm (17 lbf. ft.).

11. Install the leak off line (2) Figure 102, using new copper washers (4) on either side of the banjo fitting. Torque the leak off line retaining bolt (1) to 6 Nm (53 lbf. in.).

12. Install the high pressure line and tighten the nut (3) Figure 102, to 24 Nm (18 lbf. ft.).

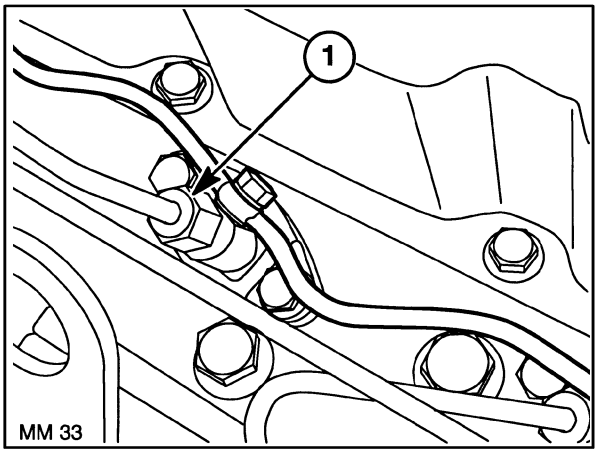
13. Repeat the process on the remaining injectors.

14. Bleed the fuel system as detailed in Operation 39 in this section.

15. Start the engine and visually inspect for leaks.

NOTE: *Unauthorised modification or adjustment of fuel injection equipment outside specification will invalidate the warranty.*

GENERAL MAINTENANCE (to be performed as and when required)



105

OPERATION 39
BLEEDING THE FUEL INJECTION SYSTEM - Figure 105

It may be necessary after injection pump removal, replacement of injector high pressure lines or after running out of fuel, to purge the system of air to allow the engine to start.

If the engine fails to start after several turns, after one of the above situations has occurred, bleed the system using the following procedure:

1. Ensure the tractor has adequate fuel and the battery is fully charged.

2. Bleed the fuel system as described in step 5, Operation 30.

3. 'Crack' open the nuts (1) on the high pressure lines to each of the injectors. With the aid of an assistant, crank the engine on the starter motor to expel the air. Tighten the injector nuts as the engine begins to fire.

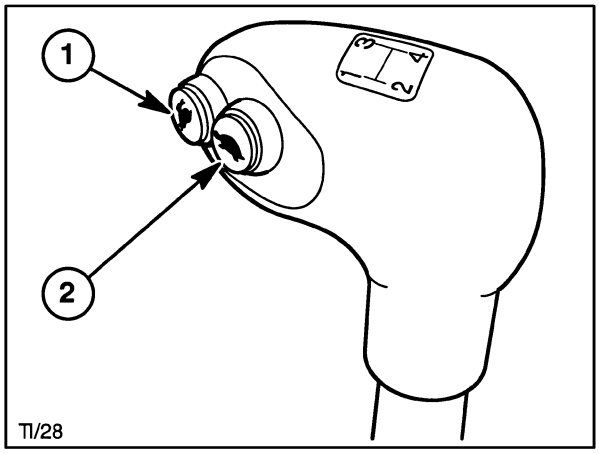
OPERATION 40
TRANSMISSION CLUTCH CALIBRATION (Dual Command Transmission Only) - Figures 106 To 113

NOTE: *Dual Command transmission has directional clutches that require periodic calibration to compensate for wear. This service should be performed at the first 50 hour service and thereafter only if a deterioration in gear shifting quality is noted. It is recommended that this operation be performed by an authorised dealer.*

IMPORTANT: *During the calibration procedure, the transmission control module detects precisely the point at which the clutches start to engage. This engagement is detected by a very small reduction in engine speed. During calibration, it is essential that no action is taken to cause the engine speed to vary. Ensure that the air conditioner and all electrical equipment is switched off. Do not operate the PTO or any hydraulic lever or move the hand or foot throttle.*

Preparing the Tractor for Calibration

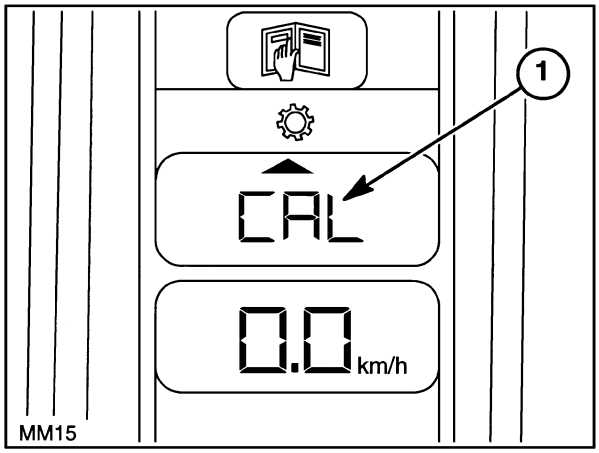
NOTE: *The clutches should be adjusted when the transmission oil is at a temperature of 20° C (68° F) or over.*



106

Prior to calibrating the directional clutches, carry out the following:

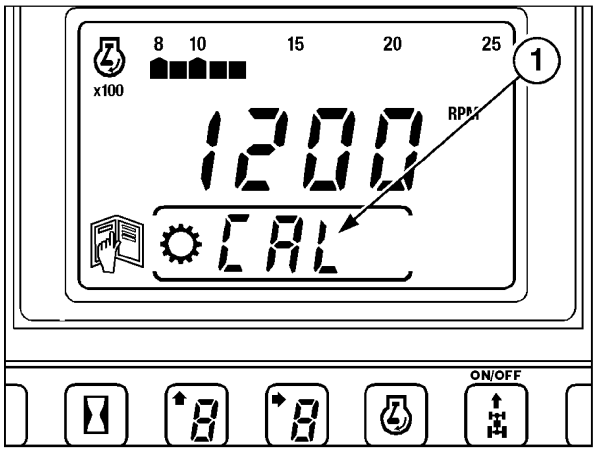
1. Park the tractor on level ground away from any obstacles (in case of unexpected tractor movement).



107

2. Turn off all electrical equipment, including the air conditioning (where fitted), stop the engine and place remote hydraulic controls in the neutral position. Lower hydraulic equipment to the ground.

3. Engage the parking brake, place all gear shift levers in neutral. block the wheels, front and rear.



108

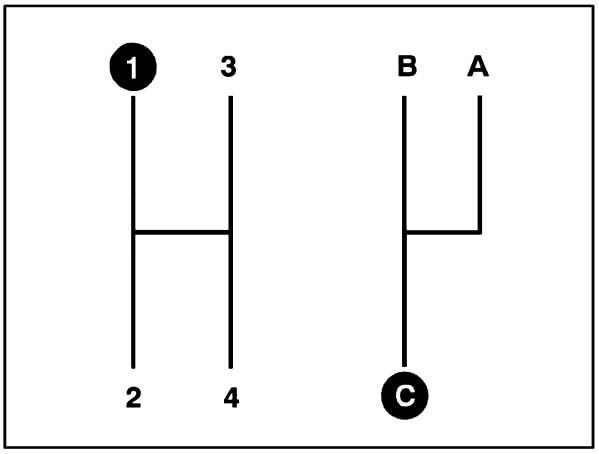
4. Press and hold in both Dual Command shift buttons (1) and (2) Figure 106, on the main gearshift lever. While holding in the buttons, start the engine.

5. 'CAL' will be displayed in the transmission display on the instrument panel. See Figures 107 or 108. Release the Dual Command shift buttons.

6. Depress the clutch pedal and use the gear shift levers to select 1st. gear, high range (C), forward shuttle position -see Figure 109. Release the clutch pedal.

7. Adjust engine speed, by means of the hand throttle, to 1200 ± 100 rev/min.

The transmission is now ready for calibration.



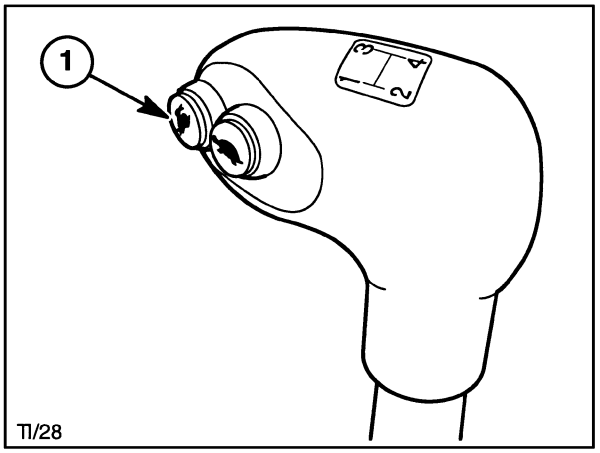
109

Upshift Clutch Calibration - Figure 110
To calibrate the upshift clutch:

1. Press and hold in the upshift button (1) on the main gearshift lever. If an error code ('U' followed by a two digit number) is displayed in the instrument panel, then the calibration conditions have not been met. See table on page 4-56 for explanation of error codes.

2. If calibration conditions are correct, 'Hi' will be briefly displayed followed by a numerical value. The number displayed will be a low value, gradually increasing until the reading is steady when a slight reduction in engine speed will be noted.

3. Release the upshift button.



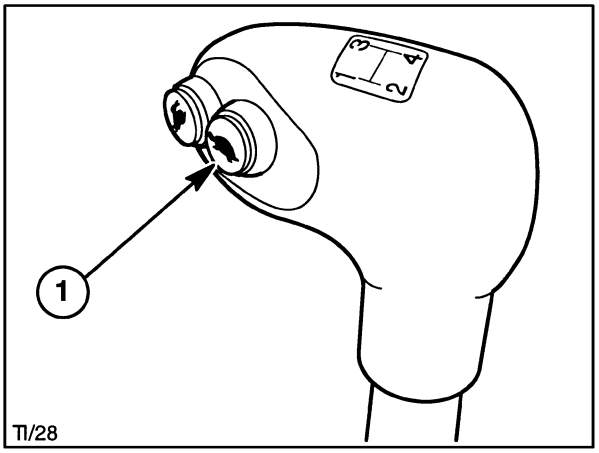
110

Downshift Clutch Calibration - Figure 111
To calibrate the downshift clutch:

1. Press and hold in the downshift button (1) on the main gearshift lever. If an error code ('U' followed by a two digit number) is displayed in the instrument panel, then the calibration conditions have not been met. See table on page 4-56 for explanation of error codes.

2. If calibration conditions are correct, 'Lo' will be briefly displayed followed by a numerical value. The number displayed will be a low value, gradually increasing until the reading is steady when a slight reduction in engine speed will be noted.

3. Release the downshift button.

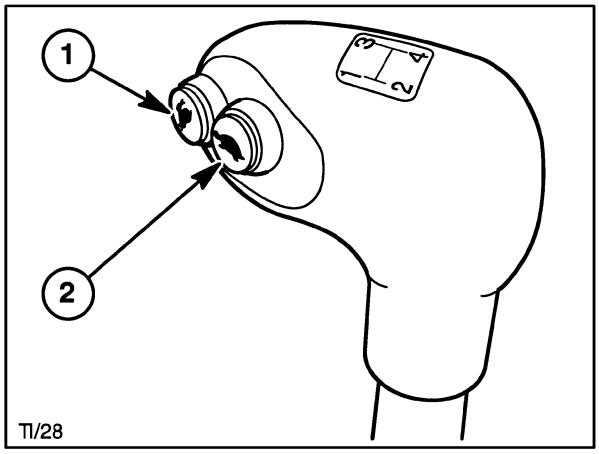


111

Synchro Calibration - Figure 112

1. Press and hold in both Dual Command shift buttons (1) and (2) on the main gearshift lever. If an error code ('U' followed by a two digit number) is displayed in the instrument panel, then the calibration conditions have not been met. See table below for explanation of error codes.

2. Under normal calibration conditions, 'Soc' will be displayed for a few seconds then the numbers 1 to 5 will be displayed sequentially, indicating progression through the synchroniser calibration. When calibration is completed, 'End' will be displayed.

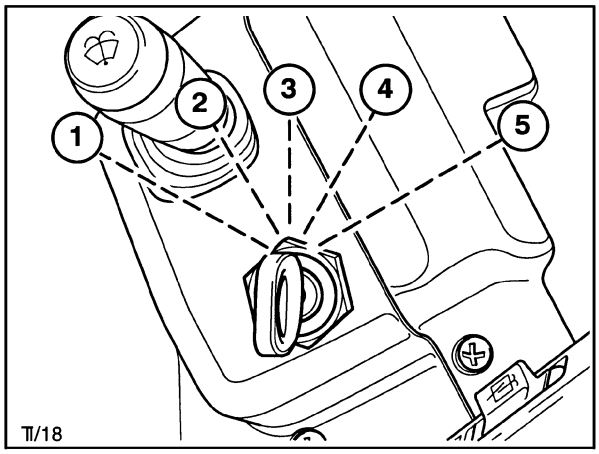


112

To Exit The Calibration Mode - Figure 113

1. Turn the key-start to the off position (2).

The tractor is now ready for normal operation.



113

Error Codes

Code	Meaning
U2O	Correct start up sequence was not used. Depress and release the clutch pedal, then repeat the high range clutch calibration procedure.
U21	Engine speed too low (1200 ± 100 rev/min)
U22	Engine speed too high (1200 ± 100 rev/min)
U23	Shuttle lever not in forward position.
U24	Main gear lever not in 1st. gear.
U25	Range lever not in high range.
U26	Clutch pedal not fully released.
U27	High clutch calibration too low. Starting pressure sufficient to cause engine pull down.
U28	High clutch calibration too high. Max. test pressure reached without drop in engine speed.
U29	Low clutch calibration too low. Starting pressure sufficient to cause engine pull down.
U30	Low clutch calibration too high. Max. test pressure reached without drop in engine speed.
U31	Tractor wheel movement detected.
U37	Synchroniser shuttle mode calibration - Synchro potentiometer feedback outside limits.
U38	Synchroniser hi/lo mode calibration - Synchro potentiometer feedback outside limits.
U39	Synchroniser neutral mode calibration - Synchro potentiometer feedback outside limits.

OPERATION 41
TRANSMISSION CALIBRATION
Range Command Transmission
- Figures 114 To118

NOTE: *Range Command transmission has five clutches. The clutches require periodic calibration to compensate for wear. This service should be performed at the first 50 hour service and thereafter only if a deterioration in gear shifting quality is noted. It is recommended that this operation be performed by an authorised dealer.*

IMPORTANT: *During the calibration procedure, the electronic management system detects precisely the point at which the clutches start to engage. This engagement is detected by a very small reduction in engine speed. During calibration, it is essential that no action is taken to cause the engine speed to vary. Ensure that the air conditioner and all electrical equipment is switched off. Do not operate the PTO or any hydraulic lever or move the hand or foot throttle.*

Preparing the Tractor for Calibration

NOTE: *Clutch calibration should be carried out when the transmission oil temperatures are between: 20° C (68° F) and 50° C (122° F).*

Prior to calibrating the clutches, carry out the following:

1. Park the tractor on level ground away from any obstacles (in case of unexpected tractor movement). Turn off all electrical equipment, including the air conditioning (where fitted), stop the engine and place remote hydraulic controls in the neutral position. Lower hydraulic equipment to the ground.

2. Engage the parking brake, place all gear shift levers in neutral. block the wheels, front and rear.

3. Press and hold in both powershift buttons (1) and (2) Figure 114, on the main gearshift lever. While holding in the buttons, start the engine then release the buttons. The transmission oil temperature, in ° C, will be displayed. When the correct temperature is reached, press the upshift or downshift buttons (1) to select the letter A.

- If the oil temperature is satisfactory, and the display reads ‘A’ and you can go straight to step 4.
- If the oil temperature is too cold, the display will show ‘U19’ or ‘CL’. Press the upshift button (2) to leave the calibration mode, then operate the tractor to warm the oil. Repeat steps 1, 2 and 3.
- If the oil temperature is above the specified limits, the display will show ‘CH’. Press the upshift button to exit the calibration mode, allow the oil to cool, then go to step 3.

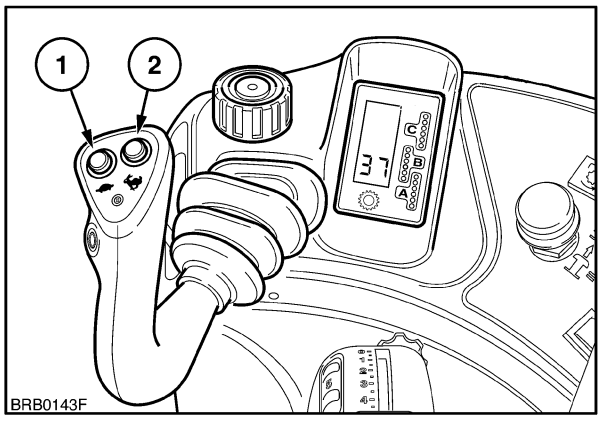
If an error code (‘U’ followed by a two digit number) is displayed in the instrument panel, then the calibration conditions have not been met. See table on page 4-58 for explanation of error codes.

⚠ WARNING ⚠

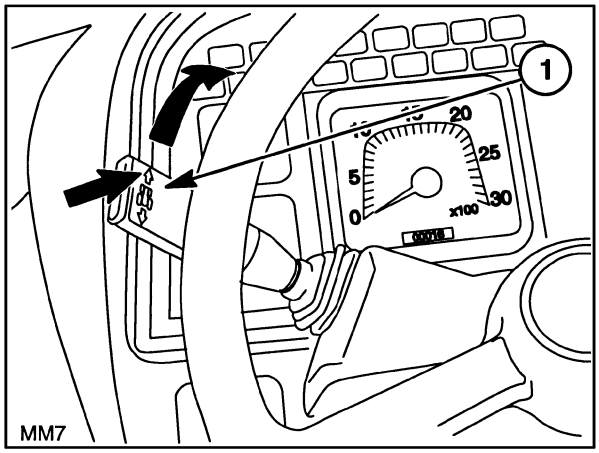
Keep hands away from hot transmission oil pipes.

Error Codes for Range Command Transmission

Code	Meaning
U19	Oil temperature too low.
U21	Engine speed too low (1200 ± 100 rev/min)
U22	Engine speed too high (1200 ± 100 rev/min)
U23	Shuttle lever not in forward position.
U26	Clutch pedal not fully released.
U31	Tractor wheel movement detected.
U36	Maximum allowed clutch calibration value exceeded.
U37	Engine speed dropped too soon during calibration.
U81	No mid-reverse synchro movement sensed.
U82	No low-high synchro movement sensed.
U83	Synchro potentiometer connectors swapped.
U84	Reverse and high synchro solenoid connectors swapped.
U85	Mid and low synchro solenoid connectors swapped.
U86	Mid-reverse synchro neutral error.
U87	Low-high synchro neutral error.
U88	Mid-reverse synchroniser calibration values out of tolerance.
U89	Low-high synchroniser calibration values out of tolerance.



114



115

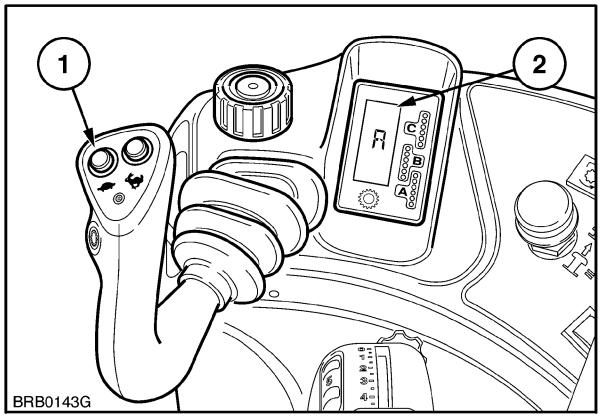
Clutch and Synchroniser Calibration

4. Move the shuttle lever (1) Figure 115, to the forward drive position.

5. Adjust engine speed, by means of the hand throttle, to 1200 ± 100 rev/min.

6. Press the downshift button (1) Figure 116 to calibrate clutch pack ‘A’. The display (2) will show ‘A’, indicating that clutch pack A is ready for calibration.

7. Press and hold in the downshift button (1) Figure 116, to calibrate clutch A. The display (2) will show a value for several seconds while engine speed stability is monitored and the synchronisers are shifted, then the value displayed will increase quite rapidly. Calibration is complete when the display alternates between the final value and the letter ‘A’.



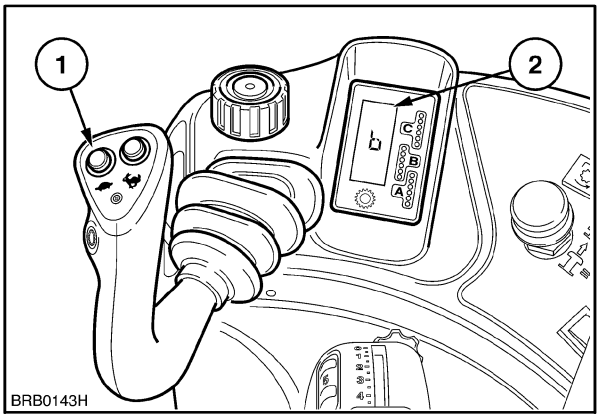
116

8. Release the downshift button (1) Figure 117. The display (2) will change to ‘b’, indicating that clutch pack B is ready for calibration.

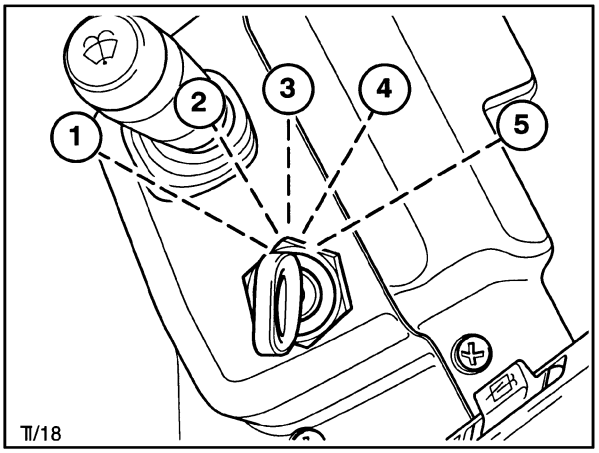
9. Repeat step 7 for clutches B, C, D and E. After clutch E has been calibrated, release the downshift button and the display will change to ‘F’.

10. Turn the key-start switch to the off position (2) Figure 118 to store the calibration values.

The tractor is now ready for normal operation.



117

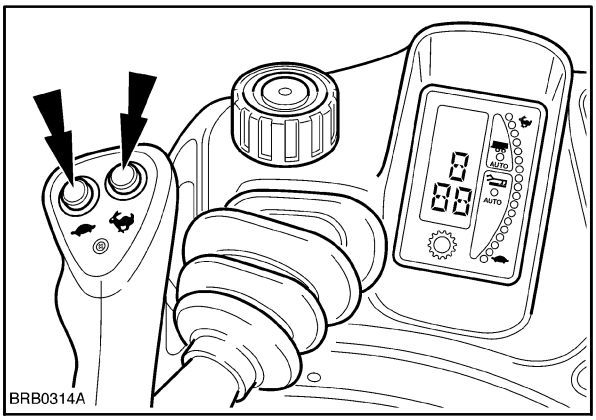


118

OPERATION 42
TRANSMISSION CLUTCH CALIBRATION
Power Command Transmission

The Power Command transmission has 9 clutch packs requiring periodic calibration to compensate for wear. Calibration should only be necessary if a deterioration in gear shift quality is noted.

NOTE: *During the calibration procedure the electronic management system detects precisely the point at which the clutches start to engage . The engagement is detected by a reduction in engine speed. During calibration it is essential that no action is taken to to cause the engine speed to vary. Be sure that the air conditioner and all electrical equipment is switched off. Do not operate the PTO or any hydraulic lever or move the hand or foot throttle.*



119

Preparing the Tractor for Calibration

NOTE: *The clutches should be adjusted when the transmission oil temperature is between 60°C (140°F) and 105°C (221°F).*

Park the tractor on level ground, away from obstacles (in case of unexpected tractor movement).

Apply handbrake, switch off all electrical equipment and air conditioning if fitted. Stop the engine and place remote levers in neutral and lower hydraulic equipment to the ground.

Place the shuttle in neutral. Block the wheels, front and rear.

Press and hold both Up/down shift buttons, figure 122, and start the engine.

Error Codes for Power Command Transmission

Code	Meaning
U19	Oil too cold.
U21	Engine RPM too low.
U22	Engine RPM too high.
U23	FWD not engaged.
U26	Clutch pedal not fully released.
U31	Tractor wheel movement detected.
U33	Hand brake not applied
U34	Operator seat switch not depressed.
U36	Calibration high error.
U37	Calibration low error.

Release the buttons. The display will change to show transmission temperature. Press the up or downshift button to proceed.

If the temperature is less than 10°C Error Code ‘U19’ will be displayed. If the temperature is between 10°C and 60°C “CL” will be displayed. If the temperature is to high, above 105°C, “CH” will be displayed.

If ‘U19’ is displayed calibration will not be possible and the oil will have to be warmed before proceeding.

If ‘CL’ or ‘CH’ are displayed after 4 seconds the display will return to oil temperature and the tractor may be operated to obtain the correct transmission oil temperature. If it is not practical to wait for the oil temperature to change press either of the up or down shift buttons while ‘CL’ or ‘CH’ is being displayed. The display will then show an ‘A’ and calibration can proceed.

Move the shuttle lever to forward and release the clutch pedal.

Set engine speed to 1200 ERPM ±100.

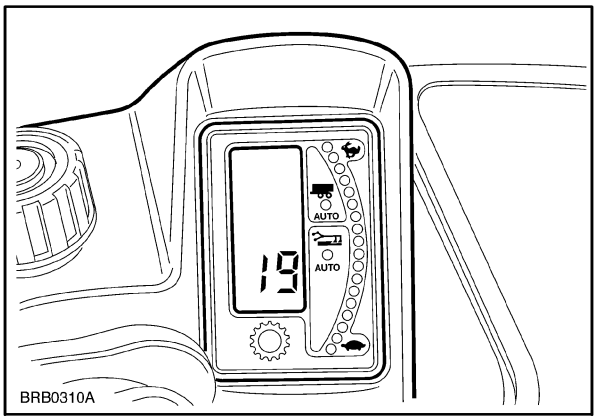
The transmission is now ready for calibration.

Press and hold the downshift button to calibrate clutch A.

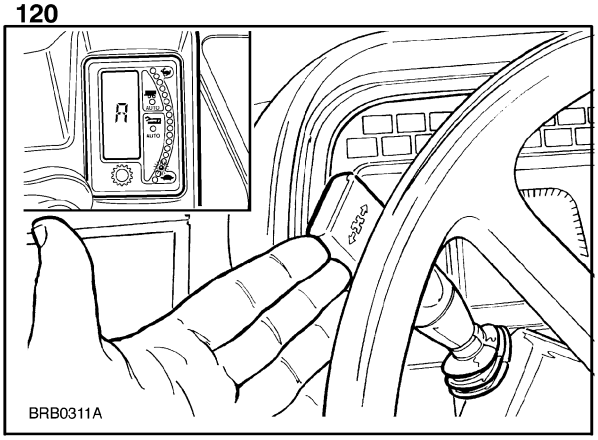
If the start up procedure was incorrect a “U” code will appear.

Hold the downshift button until the engine speed decreases by 50 RPM and the calibration number stops increasing.

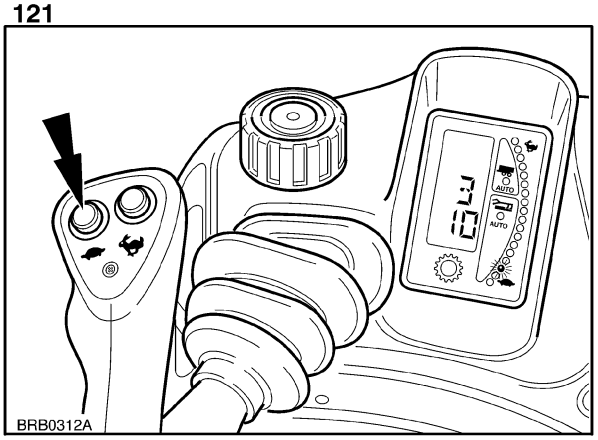
Release the downshift button, the display will change to ‘b’, indicating that clutch B is ready for calibration. Hold the downshift button until the engine speed decreases by 50 RPM and the calibration number stops increasing.



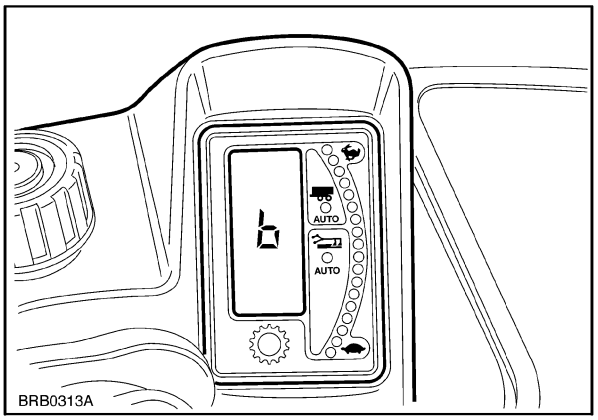
120



121



122



123

Repeat the above steps for clutches C, D, E and F1, F2, F3 and R. After clutch R has been calibrated, release the downshift button and the display will change to A.

Turn the key start switch off for at least 2 seconds to store the calibration values.

NOTE: *Transmission output speed, seat switch, hand brake switch and clutch pedal position are constantly monitored. Calibration cannot proceed unless the tractor is stationary and the clutch pedal released.*

Repeatedly depressing the upshift button will cycle through each clutch mode, enabling a particular clutch to be calibrated several times if required.

AUTOMATIC CALIBRATION SEQUENCE MODE:

When the tractor is set up correctly for the calibration sequence, ie, upshift and downshift buttons applied simultaneously and the display showing 'A', (to calibrate clutch A), pressing the AUTO FUNCTION pushbutton will start the automatic calibration sequence.

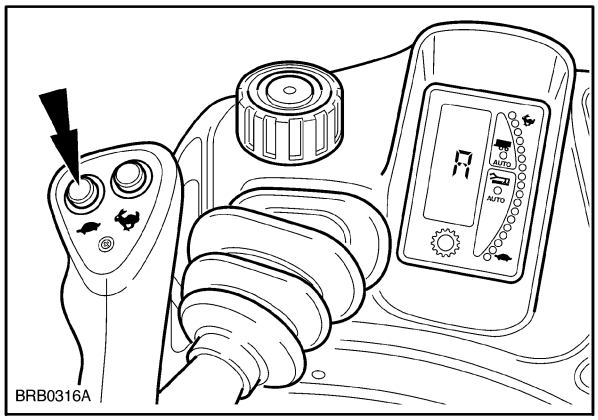
Both the FIELD and TRANSPORT indicator lamps will flash while in this mode. The clutches will be calibrated one by one without the need to keep the downshift button depressed.

If an error occours while in auto mode the sequence is stopped and the relevant code displayed. Press the auto function pushbutton or the upshift/downshift pushbuttons to clear the error.

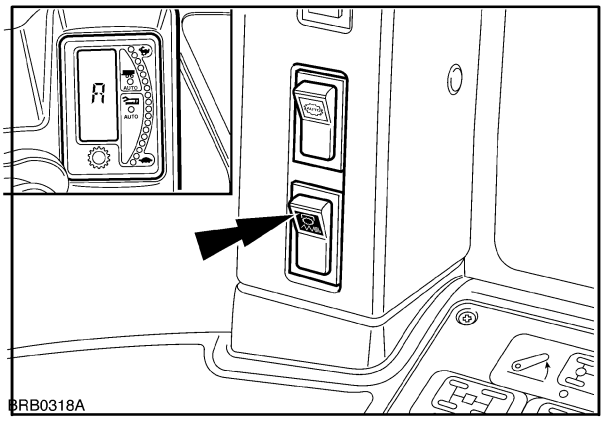
NOTE: *In 'automatic calibration sequence' the seat switch is constantly monitored, if the operator leaves the seat the sequence will be stopped.*

⚠ CAUTION ⚠

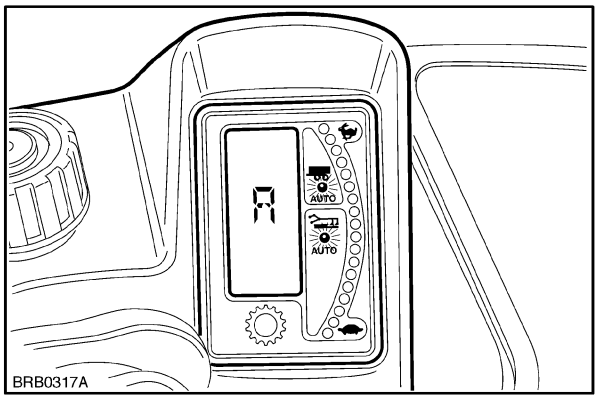
The tractor is drivable even if calibration has not been completed. Pay attention in this condition as the tractor could be jerky or sluggish. Always pull away using the clutch pedal very carefully.



124



125

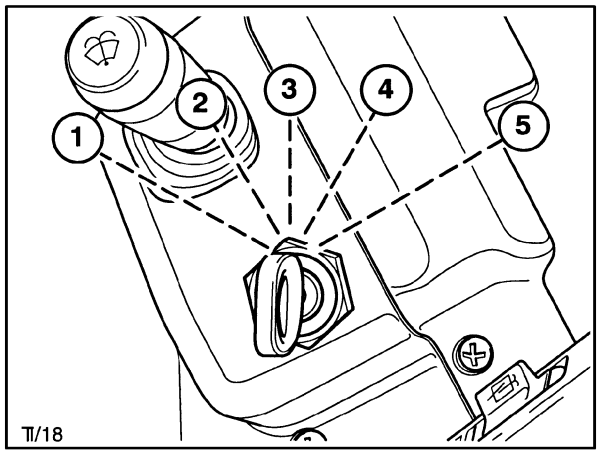


126

OPERATION 43
CALIBRATING THE EMU (Electronic Management Unit) - Figures 127 to 129

The EMU and touchpanel are calibrated at the factory to ensure that the unit is set up for your particular tractor build. If any change is made to the tractor specification, such as change of tyre size, installation of a new radar unit or steering angle sensor then recalibration will be required.

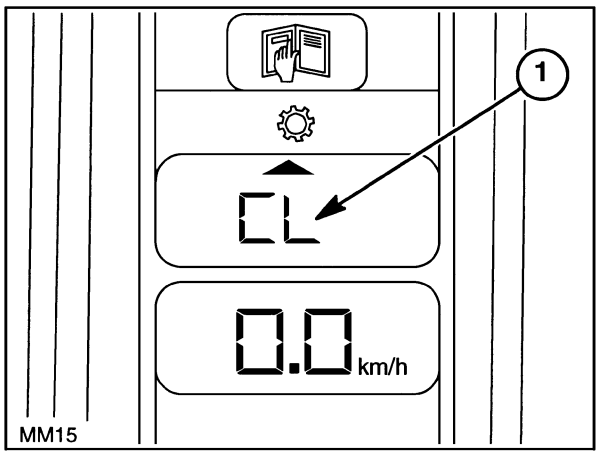
Before calibration, it will be necessary to find a convenient stretch of straight, level road, at least 100 metres long. Draw two chalk lines across the road exactly 100 metres apart. Position the tractor before the first mark in the road and turn the key-start switch to the off position (2) Figure 127.



127

1. While depressing both the manual differential lock touchpad (1) Figure 130 and the manual four wheel drive touchpad (4), turn the keystart switch to the crank position (5) Figure 127 to start the engine, then release the key. The LED's (2) and (3) Figure130, will flash. Release touchpads (1) and (4).

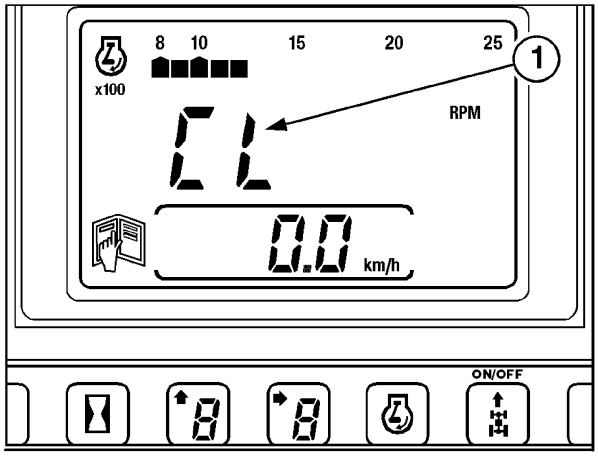
The EMU is now in the calibration mode and the letters 'CL' will be displayed by selecting P.T.O. speed with the relevant touchpad. See (1) Figure 128 or 129, according to the type of instrument panel installed.



128

NOTE: *If your tractor is equipped with the 3-pad touch panel then the manual differential lock touchpad and the manual four wheel drive touchpad will be in the same position as shown in Figure 130.*

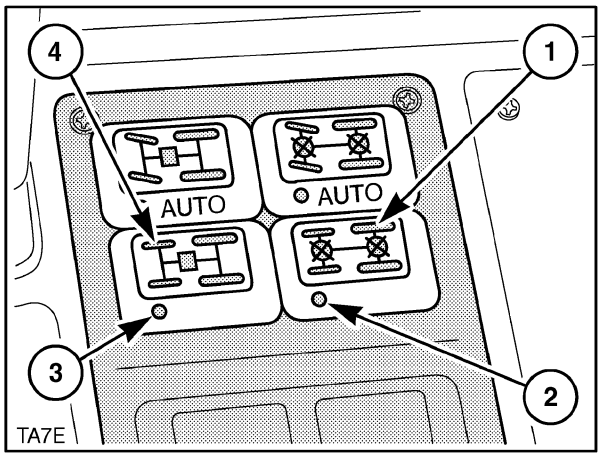
2. Select a gear and drive the tractor over the measured 100 metres. As you pass over the first chalk mark, momentarily depress the differential lock touch-pad (1) Figure 130. The differential lock LED (2) will flash at a slower rate and the letters 'CL' will also flash in the instrument panel.



129

3. As the tractor passes over the second mark in the road, momentarily depress the differential lock touch-pad a second time. The CL letters in the instrument panel will become steady.

4. Stop the tractor and turn the key-start switch off.



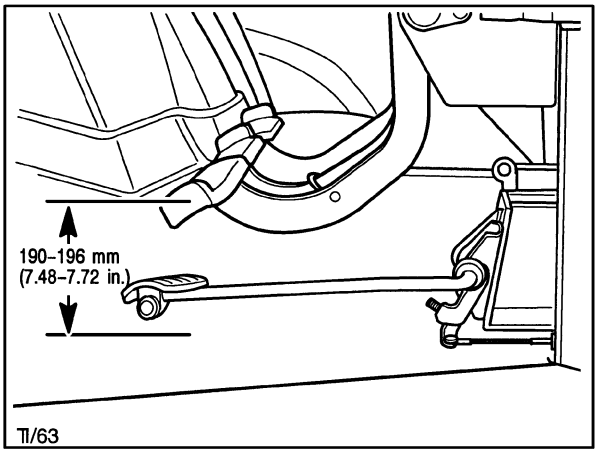
130

Calibration is now complete and the tractor ready for normal operation.

OPERATION 44

CHECK BRAKE PEDAL LATCHING/UNLATCHING – Figures 131 and 132

The hydraulically actuated brakes require no adjustment. However, if any part of the brake pedal linkage or the master cylinder assembly is replaced or if the pedal latch will not readily engage the hole in the right-hand pedal shank, adjust the pedal height, as follows:



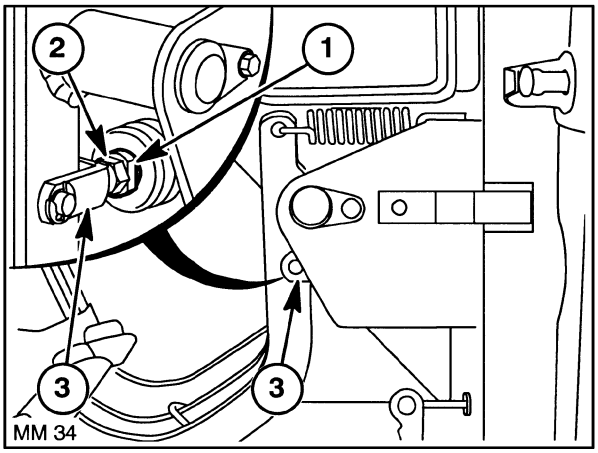
131

With the brake pedals unlatched, measure the distance between the vertical centre of the **right-hand** edge of the **right-hand** brake pedal and the floor (with rubber mat removed), as shown in Figure 131. The dimension should be 190 – 196 mm (7.48 – 7.72 in.).

If adjustment is needed, loosen the locknut (2) on the right-hand pedal yoke (3) Figure 132.

Using an open ended wrench, screw the adjuster (1) in or out until the right-hand brake pedal is at the correct height. Tighten the locknut.

For correct operation of the latch, both pedals should be at exactly the same height. If necessary, adjust the left-hand pedal yoke until the latch aligns with the hole in the right-hand pedal shank.



132

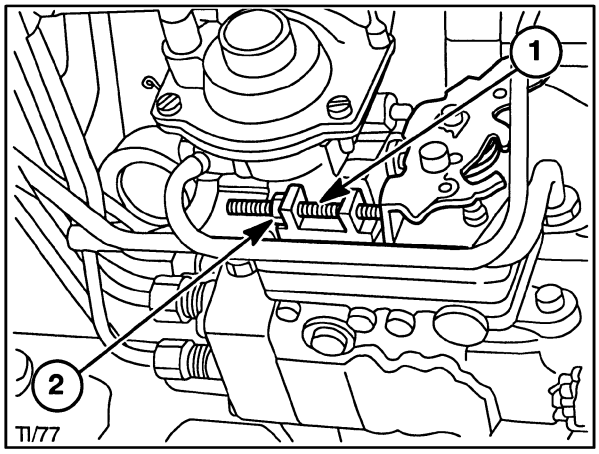
⚠ CAUTION ⚠

Owners should be aware of local regulations concerning the braking system. Regularly maintain the brakes to ensure compliance with the law and ensure your safety. If in doubt, contact your dealer.

OPERATION 45
ENGINE IDLE SPEED - Figure 133

Loosen the locknut (2) and turn the stop screw (1) to adjust the engine idle speed.

The maximum no-load speed is set in the factory and must only be adjusted, if required, by an authorised dealer.



133

OPERATION 46
AUTOMATIC PICK-UP HITCH
- Figure 134

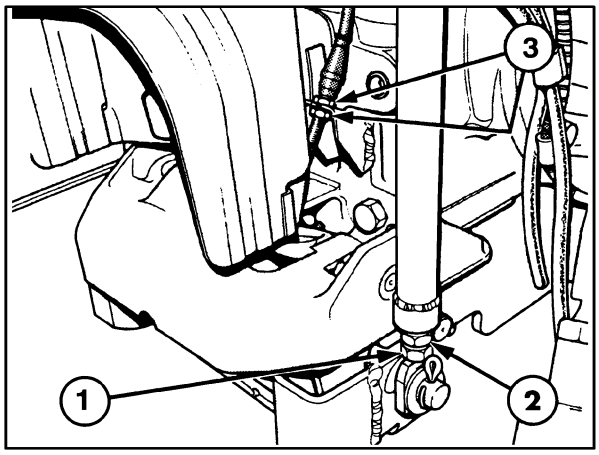
Place a load on the pick-up hitch hook. a trailer or implement is suggested. Ensure that the hitch will latch and unlatch satisfactorily.

If adjustment is necessary, remove the load from the hitch hook. Loosen the locknuts (1) and turn the adjuster (2) on each lift rod equally. Ensure that both hitch lift arms are supporting the hitch equally at the start of raise. Check that the hitch will latch and unlatch.

When fully raised ensure that the hydraulic system relief valve does not blow or that the hitch lift rods are not under tension. Both these symptoms indicate that the hitch lift rods are too short.

Tighten the locknuts to 100 nm (72 lbf. ft.).

With the hitch latched in the raised position, adjust the operating cable by means of the adjuster nuts (3) to remove all slack from the inner cable.



134

OPERATION 47
AIR CONDITIONER

If, after several seasons, the air conditioner appears to be less efficient than expected, have the dehydrator filter changed and the complete system checked by your authorised dealer.

⚠ WARNING ⚠

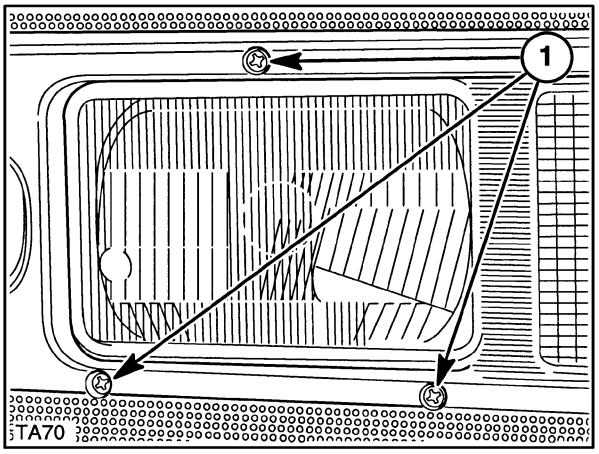
The refrigerant used in the air conditioner system has a boiling point of -12 ° C (10 ° F).

- *Never expose any part of the air conditioner system to a direct flame or excessive heat because of the risk of fire or explosion.*
- *Never disconnect or disassemble any part of the air conditioner system. escaping refrigerant will cause frostbite. Allowing refrigerant to escape into the atmosphere is illegal in many countries.*
- *If refrigerant should contact the skin, use the same treatment as for frostbite. Warm the area with your hand or lukewarm water at 32 - 38 ° C (90 -100 ° F). Cover the area loosely with a bandage to protect the affected area and to prevent infection. Consult a doctor immediately.*
- *If refrigerant should contact the eyes, wash the eyes immediately with **cold** water for at least 5 minutes. consult a doctor immediately.*

OPERATION 48
HEADLIGHT AND WORKLAMP ADJUSTMENT

Headlights - Figure 135
To avoid blinding oncoming drivers, adjust the angle of the headlight beams.

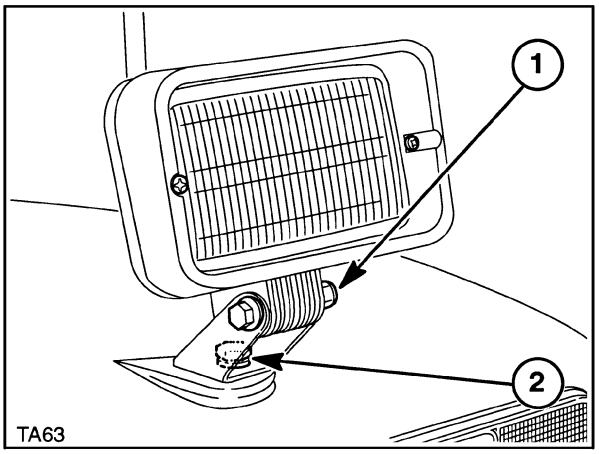
Each headlight is secured to the bezel by three spring-loaded screws (1). The beam may be adjusted vertically or laterally by turning one or more of the screws in or out, as required.



135

Worklamps - Figure 136
Dependent upon model and specification, adjustable worklamps may be installed on the front and rear of the cab roof, low down at the front of the cab or on the rear fenders. Non-adjustable worklamps are mounted on the front of the hood, adjacent to the headlights.

To adjust a worklamp, simply tilt the lamp assembly up or down, as required. loosen the clamp nut (1), if necessary. To swivel the lamp sideways, loosen the bolt (2), that attaches the mounting bracket to fender, cab frame or grab rail, and turn the bracket.



136

Tighten the nuts/bolts, after adjustment.

NOTE: *Worklamps may differ from those shown.*

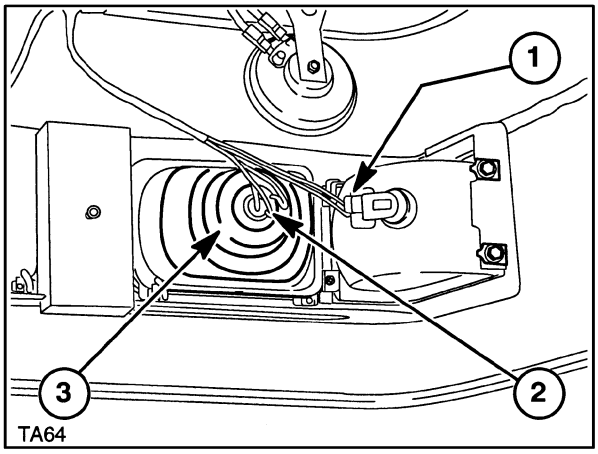
OPERATION 49
BULB REPLACEMENT

Headlights and Hood-mounted Worklamps - Figures 137 And 138
IMPORTANT: *All headlights and worklamps have halogen bulbs. Never touch a halogen bulb with the fingers. Natural moisture in the skin may cause the bulb to fail prematurely when switched on. Always use a clean cloth or tissue when handling halogen bulbs.*

The headlights and two non-adjustable worklamps are mounted in a moulded unit attached to the radiator grille. All bulbs are accessible from the rear of the lamp unit, inside the hood area.

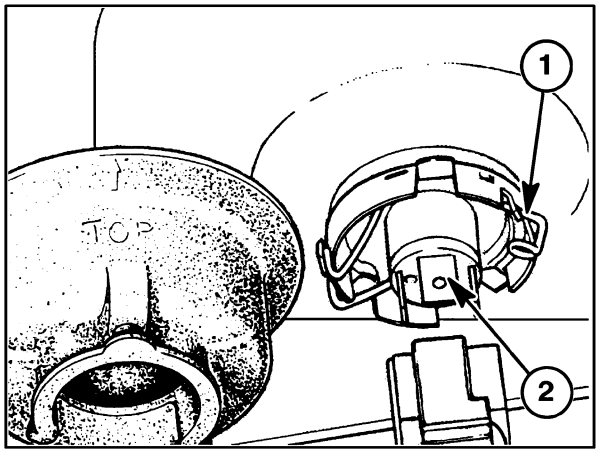
To change a worklamp bulb, first unclip and pull off the electrical connector (1) Figure 137. Rotate the bulb assembly a quarter turn anti-clockwise and remove. Re-assemble in reverse order.

To change a headlight bulb, first pull off the electrical connector (2) Figure 137 and remove the rubber cap (3) from the rear of the lamp assembly.



137

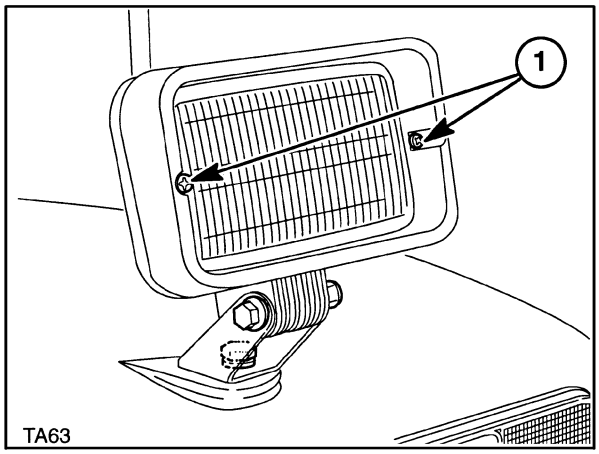
Unhook the retaining spring (1) Figure 138 and remove the bulb assembly (2). Re-assemble in reverse order.



138

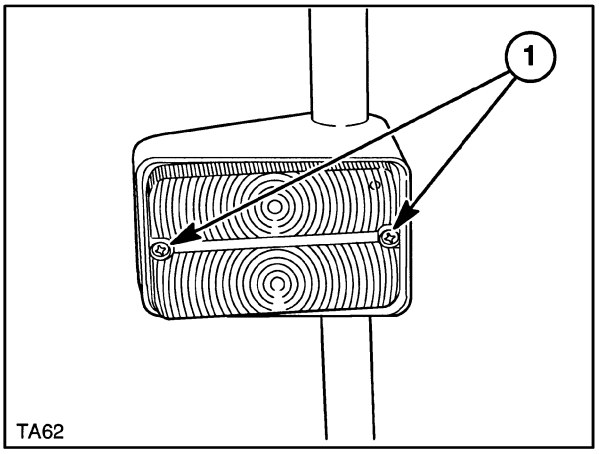
Adjustable Worklamps - Figure 139
To replace a worklamp bulb, remove the two screws (1) and take out the complete lamp assembly from the body. Bulb replacement is then the same as for the hood-mounted worklamps, described above.

NOTE: *Some worklamps may have four securing screws in place of the two shown in Figure 139.*



139

Stop/Turn/Position Lights - Figure 140
Although there are differing styles of light, front and rear and also for different markets, etc., access to the bulbs is as described in the following text and as shown in Figure 140.



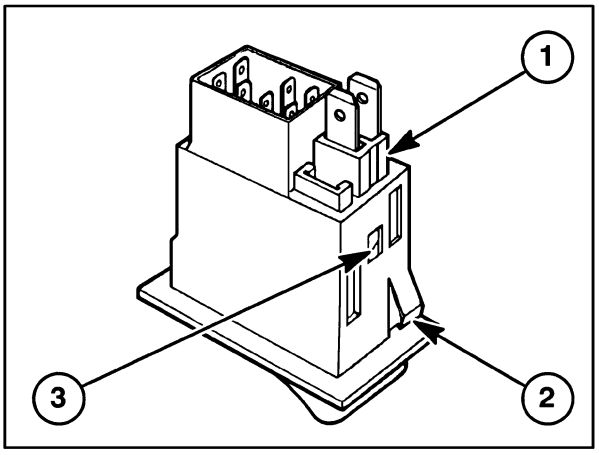
140

The bulbs are accessible after removal of the plastic lens assembly. Remove the two screws (1) and take out the lens/reflector assembly. The bulbs have a conventional bayonet cap and may be removed by pressing in and turning approximately 20° anti-clockwise. Re-assemble in reverse order.

IMPORTANT: *When replacing the lens, take care not to overtighten the retaining screws.*

Rocker Switch Bulbs - Figure 141
Certain of the rocker switches are internally illuminated, the bulb being removeable from the rear of the switch assembly.

The switch assembly is retained by a sprung tag at either end. use a small screwdriver to pry one end of the rocker switch from the sheet metal and withdraw the switch assembly.



141

To change a bulb, press in the tag using a small screwdriver and pull the bulb retainer from the back of the assembly. The bulbs are of the capless type, rated at 1.2w and are a push fit in the retainer.

After changing the bulb, push the retainer into the back of the switch assembly until the tag locates in the aperture. Re-install the switch assembly.

Instrument Panel Bulbs - Figures 142 And 143
The warning and panel light bulbs are removeable from the rear of the instrument panel. To gain access, remove the two retaining screws from the lower edge of the instrument panel surround and withdraw the instrument panel assembly. Disconnect the electrical connectors from the rear of the panel, as necessary.

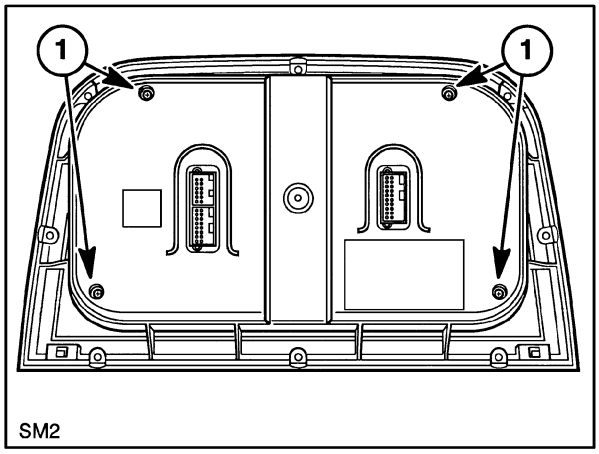
NOTE: *There are three types of instrument panel available and the rear views shown in Figures 142 and 143 may differ from the panel fitted to your tractor. However the method of removing the rear cover and bulbs is similar on all models.*

Remove the four screws (1) Figure 142, holding the cover to the rear of the panel.

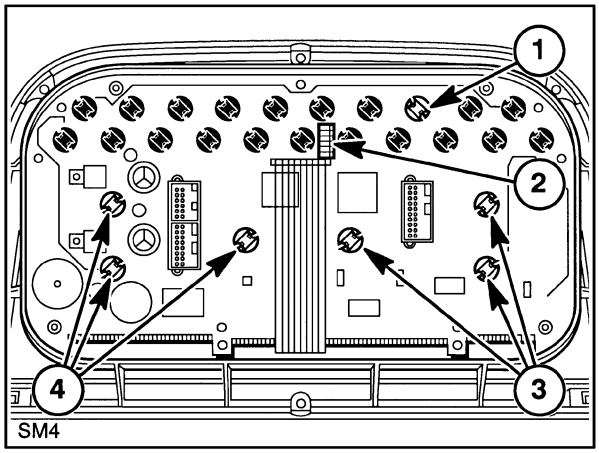
With reference to Figure 143, turn the failed bulb $^1/_4$ turn anti-clockwise and remove. Re-assemble in reverse order.

IMPORTANT: *The two rows of warning light bulbs at the top of the panel are coloured black, except for the alternator warning light bulb (1) figure 143, which is red. The red bulb is of a different wattage to the others and it is important that the correct bulb is used in this position otherwise the alternator may not function. The instrument backlight bulbs (3) and (4) are coloured yellow.*

IMPORTANT: *If your tractor has the electronic instrument panel, removal of the rear cover will expose six micro-switches (2) Figure 143. The switches are used in the factory to set up the computer module. Do* ***not*** *touch any of these switches as the performance of the instrument panel and associated electronic equipment will be affected and your warranty may be invalidated.*



142



143

OPERATION 50
FUSES AND RELAYS - Figures 144 to 147

The fuse box is located behind a panel on the right-hand side of the instrument console. See Figure 6 on page 4-5.

To check or change fuses, remove the right-hand panel from the instrument console, as described on page 4-5. To check or change a 'maxi' fuse, remove the left-hand panel.

The fuse box has a snap on lid. Pull off the lid of the fuse box to gain access to the fuses and relays (see Figure 144. The fuses and relays are shown diagrammatically in Figure 145.

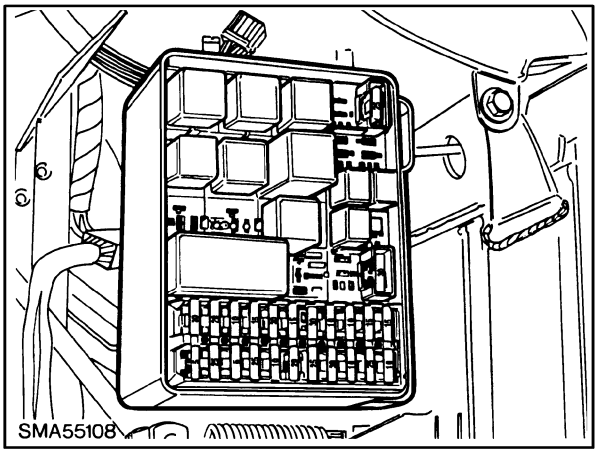
There is provision for 24 fuses within the main fuse box although they may not all be fitted to your tractor. in addition, certain items of equipment may not be installed on your tractor. However, the fuses for these features may still be fitted and can be used as spares. Fuse no. 25 is not installed in the main fuse box but is attached to the outside of one of the 'maxi' fuse boxes. See text below.

IMPORTANT: *Do not replace a blown fuse with another of a different rating.*

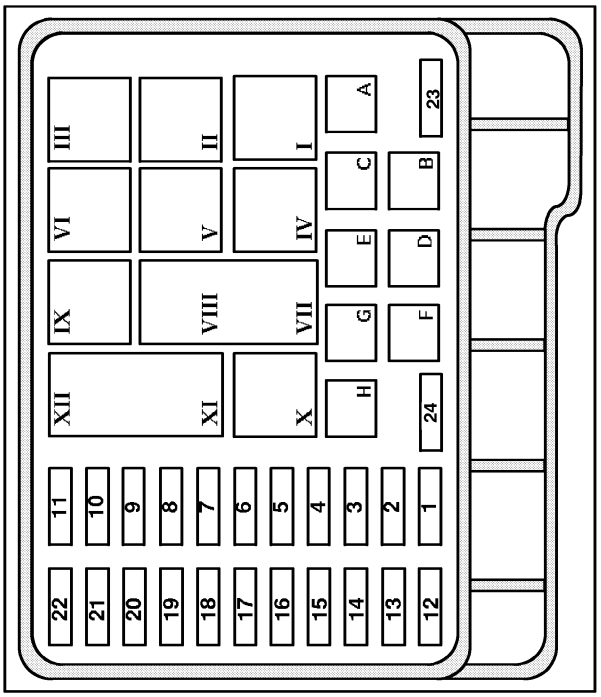
The fuses are numbered and color-coded as shown in the chart on the next page.

NOTE: *Items i to xii and a to h are relays (refer to Figures 144, 145 and the chart on the next page). Not all the relays shown may be fitted. See your authorised dealer if you have a problem with any of the circuits listed that is not caused by fuse failure.*

In addition to the main fuse box shown in Figures 144 and 145, there are additional 'maxi' fuses located behind the panel on the left-hand side of the instrument console. The maxi fuses are provided to protect the main fuse box and electrical circuitry. A major power failure, i.e. the failure of several electrical circuits, may signify a blown maxi fuse.



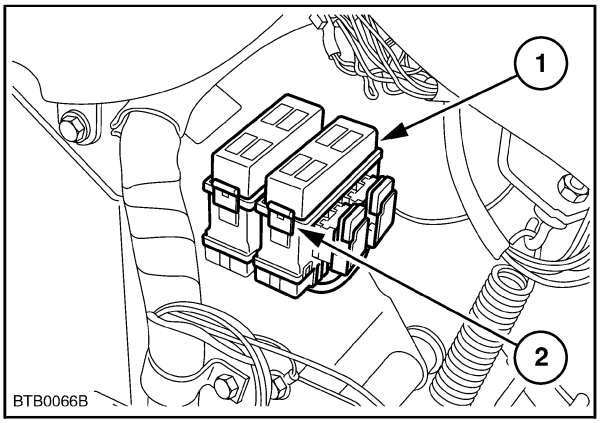
144



145

Fuse No.	Amps	Colour	Circuit
1	15	Lt. blue	Headlight main beam
2	15	Lt. blue	Headlight dipped beam
3	20	Yellow	Side lights R.H. & console lamp
4	20	Yellow	Side lights L.H.
5	30	Green	Work lamps (cab roof mounted)
6	15	Lt. blue	Work lamps (lower rear)
7	30	Green	Work lamps (lower front)
8	15	Lt. blue	Fuel shut off/pump
9	10	Red	Gauges/external switches/radar
10	20	Yellow	Hazard lights
11	30	Green	Horn/headlight flasher, cigar lighter & roof beacon
12	10	Red	E.D.C. valve supply
13	25	Natural	Transmission feed
14	10	Red	Transmission control supply Front axle suspension
15	30	Green	Air seat compressor, E.M.U., front hitch & tractor stop lamps
16	25	Natural	Heater fan
17	20	Yellow	Washer-wiper
18	15	Lt blue	Turn indicators
19	25	Natural	Thermostart
20	10	Red	'Keep alive' memory for E.D.C., Transmission Control Module & Electronic Management Unit
21	25	Natural	P.T.O.
22	5	Tan	Radio & clock feed
23	25	Natural	Accessory sockets/interior light
24	5	Tan	'Keep alive memory' for clock & radio
25	20	Yellow	Trailer stop lamps (7-pin socket)
26	5	Tan	Starter-Power Command only

Relay	Circuit Identification
I	Ignition relay
II	Hydraulic diverter valve relay
III	Thermostart relay
IV	Intermittent rear wiper module
V	Not used
VI	Intermittent front wiper module
VII & VIII	Front hitch control module
IX	Trailer brake
X	Fender mounted P.T. O.control
XI & XII	I.S.O. or N.A.S.O. module
A	T.C.M. solenoid valve power relay
B	Upper front work lamps relay
C	Upper rear work lamps relay
D	Lower front work lamp relay
E	Lower rear work lamps relay
F	Fuel shut-off relay
G	Stop lamps relay
H	Trailer brake relay



146

To check or change a 'maxi' fuse, remove the left-hand panel as described on page 4-5.

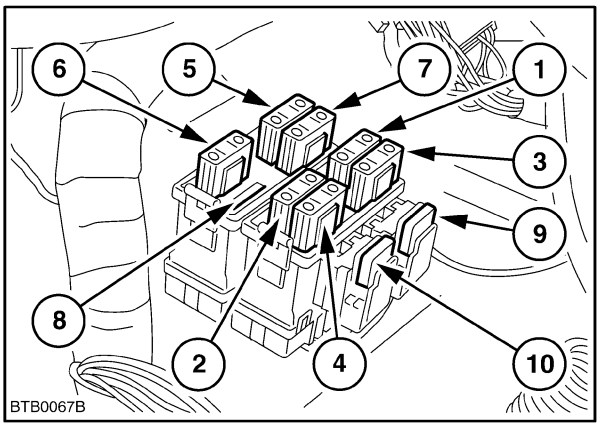
With reference to Figure 146, pry the spring clips (1) apart to free the lid (2) of the fuse box and expose the fuses.

IMPORTANT: *Never replace a blown fuse with another of a different rating.*

The maxi fuses are numbered and colour-coded. See Figure 147 and the following chart:

Fuse No.	Amps	Colour	Feeds to following circuits
1	50A	Red	Fuses 9,15, 16, 17, 18 and 19 through relay No. 1.
2	60A	Blue	Fuses 10, 11, 19, 20 and ignition switch.
3	30A	Green	Turn signal switch.
4	60A	Blue	Fuses 5, 6 and 7.
5	30A	Green	Fuses 23 and 24
6	40A	Amber	Implement socket (rear)
7	40A	Amber	Implement socket (front)
8	-	-	Not used

Items 9 and 10 are fuses No.25 and No.26. See table on previous page.



147

PROTECTING THE ELECTRONIC AND ELECTRICAL SYSTEMS DURING BATTERY CHARGING OR WELDING

Precautions

To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.

2. Never short any of the charging components to earth.

3. Do not use a slave battery of higher than 12 volts nominal voltage.

4. Always observe correct polarity when installing the batteries or using a slave battery to jump start the engine. Follow the instructions in the operator's manual when jump starting the tractor. Connect positive to positive and negative to negative.

5. Always disconnect the earth cable from the batteries before carrying out arc welding on the tractor or on any implement attached to the tractor.

6. Position the welder earth cable clamp as close to the welding area as possible.

7. If welding is to be carried out in close proximity to a computer module, then the module should be removed from the tractor. It is recommended that this procedure be carried out by an authorised dealer.

8. Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.

9. Always disconnect the negative cable from the batteries when charging the batteries in the tractor with a battery charger.

⚠ WARNING ⚠

Batteries contain sulphuric acid. In case of contact with skin, flush the affected area with water for five minutes. Seek medical attention immediately. Avoid contact with the skin, eyes or clothing. Wear eye protection when working near batteries.

IMPORTANT: *Failure to disconnect the two earth cable connections at the battery prior to charging the batteries or welding on the tractor or attached implement will result in damage to the electronic and electrical systems.*

NOTES

SECTION 5
FAULT FINDING

INTRODUCTION

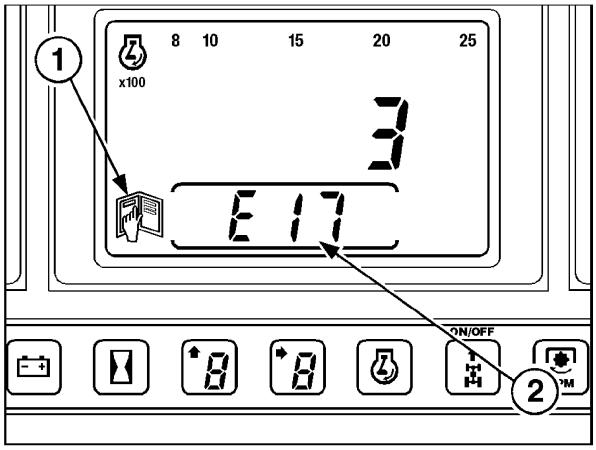
The following information is intended as a guide to assist in identifying and correcting possible tractor malfunctions and fault conditions.

The information provided is as follows:

- ERROR CODES
- SYSTEM TROUBLESHOOTING

ERROR CODES - Figures 1 and 2

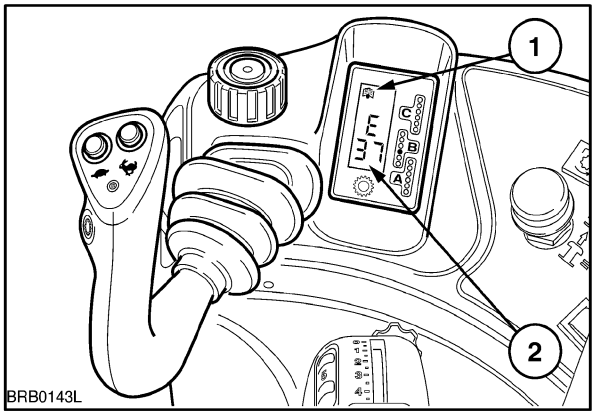
An error code indicates that there has been a malfunction in one of the electrical systems controlling the instruments, transmission, hydraulics, differential lock, four wheel drive, etc. During operation, the malfunction warning symbol (1) will appear in the liquid crystal display in the instrument panel (analogue/digital or electronic instrument panels only) or in the gear display adjacent to the powershift control (Range Command or Power Command transmission). An error code (2) will also be displayed.



1

Error codes will be displayed as a flashing one, two- or three-digit number and may be preceded by or followed by an identification letter. Additionally, some error codes consist of two letters. The letters and/or numbers will identify the specific circuit in which the malfunction has occurred and type of malfunction, such as short circuit, open circuit, etc.

Contact your authorised dealer for assistance in correcting any malfunction indicated by the appearance of an error code.



2

SYSTEM TROUBLE SHOOTING

The following information lists possible problems, their cause and corrective action. The systems are listed as follows:

Subject	Page
Engine	5-2
Transmission	
- Range Command or Power Command	5-5
- Dual Command	5-6
- Synchro Command	5-7
Hydraulics	5-8
3-point linkage	5-9
Brakes	5-10
Cab	5-10
Electrical	5-11

ENGINE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine will not start or is difficult to start	Incorrect starting procedure.	Review starting procedure.
	Low or no fuel.	Check fuel level.
	Air in fuel lines.	Bleed fuel system.
	Low ambient temperature.	Use cold starting aid.
	Contaminated fuel system.	Clean and bleed fuel system.
	Fuel pump inoperative.	Check fuse. If satisfactory, replace pump.
	Clogged fuel filter(s).	Replace fuel filter element(s).
	Malfunctioning fuel injectors.	See your authorised dealer.
	Malfunctioning fuel solenoid or solenoid relay.	See your authorised dealer.
	Incorrect engine oil viscosity.	Use correct viscosity oil.
	Incorrect fuel for operating temperature.	Use correct type fuel for temperature conditions.
	Slow starter speed.	See slow starter speed in Electrical.
Engine runs roughly and/or stalls	Clogged fuel filter(s).	Replace fuel filter element(s).
	Contaminated fuel system.	Clean and bleed fuel system.
	Fuel solenoid incorrectly adjusted.	See your authorised dealer.
	Fuel cap vent blocked.	Wash cap in clean fuel oil.

ENGINE (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine lacks power	Engine overloaded.	Shift to lower gear, reduce draft load or ballast carried.
	Air cleaner restricted.	Service air cleaner.
	Low engine operating temperature.	Check thermostats.
	Engine overheats.	See Engine overheats.
	Clogged fuel filter(s).	Replace fuel filter element(s).
	Incorrect fuel.	Use correct type fuel.
	Incorrect engine valve clearance.	Check and adjust.
	Malfunctioning fuel injectors.	See your authorised dealer.
	Malfunctioning fuel injection pump.	See your authorised dealer.
	Maximum 'no-load' speed set too low.	See your authorised dealer.
	Leaking air intake or exhaust manifold.	Check and rectify or see your authorised dealer.
	Turbocharger malfunctioning (where fitted).	See your authorised dealer.
	Implement incorrectly adjusted.	See implement Operator's Manual.
Engine knocks	Fuel injection pump timing.	See your authorised dealer.
	Low engine oil level.	Add oil, as required.
	Low engine oil pressure.	See your authorised dealer.
	Low engine operating temperature.	Check thermostats.
	Engine overheats.	See Engine overheats.
Engine overheats	Low engine oil level.	Add oil, as required.
	Low engine coolant level.	Fill coolant recovery tank. Check cooling system for leaks.
	Defective thermostat(s).	Check thermostat(s).
	Dirty/blocked radiator core.	Clean.
	Excessive engine overload.	Shift to lower gear, reduce draft load or ballast carried.

ENGINE (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine overheats	Faulty radiator pressure cap.	Replace cap.
	Cooling system blocked.	Flush cooling system.
	Loose or worn fan belt.	Check automatic tensioner, replace belt if worn.
	Leaking hose or connection.	Tighten connection and/or replace hose.
	Malfunctioning temperature gauge or sender.	See your authorised dealer.
	Malfunctioning viscous fan.	See your authorised dealer.
Low engine operating temperature	Malfunctioning thermostat(s).	Replace thermostat(s).
	Viscous fan locked up.	See your Authorised dealer.
Low engine oil pressure	Low oil level.	Add oil, as required.
	Wrong oil grade or viscosity.	Drain and refill with oil of the correct specification.
Excessive engine oil consumption	Engine oil level too high.	Reduce oil level, as required.
	Wrong oil grade or vicosity.	Drain and refill with oil of the correct specification.
	Blocked rocker box ventilation tube filter.	Replace ventilation filter.
	Malfunctioning turbocharger (where fitted).	See your authorised dealer.
	External oil leaks.	Repair leaks.
	Worn valve guides/seals.	See your authorised dealer.
Excessive fuel consumption	Low engine operating temperature.	See Low engine operating temperature.
	Malfunctioning turbocharger (where fitted).	See your authorised dealer.
	Engine overloaded.	Shift to lower gear, reduce draft load or ballast carried.
	Air cleaner restricted.	Service air cleaner.
	Incorrect fuel.	Use correct type fuel.
	Incorrect engine valve clearance.	Check and adjust.

ENGINE (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Excessive fuel consumption (continued)	Malfunctioning fuel injectors.	See your authorised dealer.
	Malfunctioning fuel injection pump.	See your authorised dealer.
	Leaking air intake or exhaust manifold.	Check and rectify or see your authorised dealer.
	Implement incorrectly adjusted.	See implement Operator's Manual.

TRANSMISSION - RANGE COMMAND OR POWER COMMAND

PROBLEM	POSSIBLE CAUSE	CORRECTION
Tractor does not drive in any gear	Error code will indicate source of malfunction.	See your authorised dealer.
Gear shift sequence incorrect or gears missing	Error code will indicate source of malfunction.	See your authorised dealer.
Jumping out of gear or holding in gear	Worn synchronisers/couplers.	See your authorised dealer.
Poor inching control when using inching pedal (clutch pedal) or jerky gear shifting	Transmission clutches require calibration.	Perform transmission clutch calibration procedure or see your authorised dealer.
High transmission operating temperature	Low oil level.	Add oil, as required.
	Incorrect oil grade/viscosity.	Drain and refill with oil of the correct specification.
	Dirty or blocked transmission oil cooler.	Clean.
Low transmission oil pressure	Low oil level.	Add oil, as required.
	Incorrect oil grade/viscosity.	Drain and refill with oil of the correct specification.
	Blocked transmission oil filter.	Replace filter.
Noisy transmission	Low oil level.	Add oil, as required.
	Incorrect oil grade/viscosity.	Drain and refill with oil of the correct specification.
	Worn bearings or failed parts.	See your authorised dealer.

TRANSMISSION – DUAL COMMAND

PROBLEM	POSSIBLE CAUSE	CORRECTION
Tractor does not drive in any gear	Error code will indicate source of malfunction.	See your authorised dealer.
Poor inching control when using inching pedal (clutch pedal)	Transmission clutch fill time out of adjustment.	See your authorised dealer.
Jerky gear shifting	Transmission clutches require calibration.	Perform transmission clutch calibration procedure or see your authorised dealer.
Jumping out of gear or holding in gear	Worn synchronisers/couplers.	See your authorised dealer.
High transmission operating temperature	Low oil level. Incorrect oil grade/viscosity. Dirty or blocked transmission oil cooler.	Add oil, as required. Drain and refill with oil of the correct specification. Clean.
Low transmission oil pressure	Low oil level. Incorrect oil grade/viscosity. Blocked transmission oil filter.	Add oil, as required. Drain and refill with oil of the correct specification. Replace filter.
Noisy transmission	Low oil level. Incorrect oil grade/viscosity. Worn bearings or failed parts.	Add oil, as required. Drain and refill with oil of the correct specification. See your authorised dealer.
Gear engagement difficult	Incorrect linkage adjustment or worn linkage. Worn shift forks/selectors. Worn bearings.	Adjust linkage, replace worn parts or see your authorised dealer. See your authorised dealer. See your authorised dealer.
Engine stalls when changing from Hi drive to Lo drive	Defective Hi drive clutch pack.	See your authorised dealer.
Engine stalls when changing from Lo drive to Hi drive	Defective Lo drive clutch pack.	See your authorised dealer.

TRANSMISSION – SYNCHRO COMMAND

PROBLEM	POSSIBLE CAUSE	CORRECTION
High transmission operating temperature	Low oil level.	Add oil, as required.
	Incorrect oil grade/viscosity.	Drain and refill with oil of the correct specification.
	Dirty or blocked transmission oil cooler.	Clean.
Noisy transmission	Low oil level.	Add oil, as required.
	Incorrect oil grade/viscosity.	Drain and refill with oil of the correct specification.
	Worn bearings or failed parts.	See your authorised dealer.
Gear engagement difficult	Incorrect linkage adjustment or worn linkage.	Adjust linkage, replace worn parts or see your authorised dealer.
	Worn shift forks/selectors.	See your authorised dealer.
	Worn bearings.	See your authorised dealer.
	Air in hydraulic clutch system.	Bleed system or see your authorised dealer.
Jumping out of gear	Incorrect linkage adjustment or worn linkage.	Adjust linkage, replace worn parts or see your authorised dealer.
	Worn shift forks/synchronisers.	See your authorised dealer.
	Worn bearings.	See your authorised dealer.
	Faulty detents.	Replace detent balls and springs or see your authorised dealer.
Holding in gear	Incorrect linkage adjustment or worn linkage.	Adjust linkage, replace worn parts or see your authorised dealer.
	Worn couplers.	See your authorised dealer.

HYDRAULICS

PROBLEM	POSSIBLE CAUSE	CORRECTION
Hydraulic system does not operate	Error code will indicate source of malfunction.	See your authorised dealer.
	Hydraulics oil level very low.	Add oil, as required.
	Blocked hydraulic oil filter(s).	Replace oil filter(s).
Hydraulic oil overheats	Hydraulics oil level too low or too high.	Adjust oil level, as required.
	Hydraulics oil cooler blocked.	Clean.
	Blocked hydraulic oil filter(s).	Replace oil filter(s).
	Flow control incorrectly adjusted.	Allow to cool, adjust flow control before operating again.
	Hydraulic load not matched to tractor.	See your authorised dealer.
Remote control valve detent disengages prematurely	Detent release pressure set too low.	Adjust detent pressure or see your authorised dealer.
Remote equipment cylinder operates too fast or too slowly	Flow control incorrectly set.	Adjust flow control.
Remote equipment does not operate	Hoses not correctly connected.	Attach hoses correctly.
	Load exceeds system capacity.	Reduce load or use correct size cylinder (see your authorised dealer).
	Remote control valve lever movement restricted.	Adjust cables or see your authorised dealer.

THREE-POINT LINKAGE

PROBLEM	POSSIBLE CAUSE	CORRECTION
3-point linkage does not move when control lever is moved	Error code will indicate source of malfunction.	See your authorised dealer.
	Hitch not in phase with the control lever.	Put lift control lever back in phase with lower links.
	Fast raise switch in external control position.	Put switch in correct position.
	Height limit control incorrectly positioned.	Adjust height limit control.
External power lift control does not operate	Fast raise switch not in external control position.	Centralise switch (external control position).
3-point linkage does not raise fully	Height limit control incorrectly positioned.	Adjust height limit control.
3-point linkage drops slowly	Drop rate control incorrectly positioned.	Adjust drop rate control.
3-point linkage slow to respond to draft loads	Position/draft control incorrectly adjusted.	Adjust position/draft control.
	Drop rate too slow.	Adjust drop rate control.
	Implement not functioning properly.	See implement operator's manual.
3-point linkage too responsive to draft loads	Position/draft control incorrectly adjusted.	Adjust position/draft control.
3-point linkage status light flashes continually	Position/draft control incorrectly adjusted.	Adjust position/draft control.

BRAKES

PROBLEM	POSSIBLE CAUSE	CORRECTION
Pedal(s) feel spongy	Air in system.	System requires bleeding. See your authorised dealer.
Excessive brake pedal travel	Brake piston seal leaking.	See your authorised dealer.
	Brake bleed valve leaking.	See your authorised dealer.
	Leakage in brake valve(s)	See your authorised dealer.
	Worn brake discs.	See your authorised dealer.

CAB

PROBLEM	POSSIBLE CAUSE	CORRECTION
Dust enters the cab	Improper seal around filter element(s).	Check seal condition.
	Blocked filter(s).	Clean or replace filters.
	Defective filter.	Replace filter.
	Damaged seals around doors/windows or roof hatch.	Replace seal(s).
Low pressuriser air flow	Blocked filter(s).	Clean or replace filters.
	Heater or evaparotor core blocked.	See your authorised dealer.
Air conditioner does not produce cool air	Heater control turned on.	Turn temperature control knob fully anti-clockwise.
	Condenser blocked.	Clean radiator, condenser and oil cooler.
	Drive belt slipping, worn or damaged.	Check automatic belt tensioner and belt condition.
	Low refrigerant level.	See your authorised dealer.

ELECTRICAL SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Electrical system completely inoperative	Loose or corroded battery connections.	Clean and tighten connections.
	Sulphated batteries.	Check battery open circuit voltage for minimum 12.6 volts. Check electrolyte level and specific gravity.
Starter speed slow - engine cranks slowly	Loose or corroded battery connections.	Clean and tighten connections.
	Low battery output.	Check battery open circuit voltage for minimum 12.6 volts. Check electrolyte level and specific gravity.
	Incorrect viscosity engine oil.	Use correct viscosity oil for ambient temperature.
Starter inoperative	Loose or corroded battery or starter motor connections.	Clean and tighten connections.
	Dead batteries.	Charge or replace batteries.
	Starter safety switch(es) operative.	Place all gear shift levers in neutral and fully depress clutch pedal.
Alternator light stays on with engine running	Low engine idle speed.	Increase engine idle speed.
	Broken/loose drive belt.	Check belt and automatic belt tensioner.
	Malfunctioning batteries.	Check battery open circuit voltage for minimum 12.6 volts. Check electrolyte level and specific gravity.
	Malfunctioning alternator	Have alternator checked by your authorised dealer.
Batteries will not charge	Malfunctioning alternator	Have alternator checked by your authorised dealer.
	Loose or corroded terminals.	Clean and tighten connections.
	Loose or worn drive belt.	Check belt and automatic belt tensioner. Replace belt, if required.
	Malfunctioning batteries.	Check battery open circuit voltage for minimum 12.6 volts. Check electrolyte level and specific gravity.

NOTES

SECTION 6
VEHICLE STORAGE

The following text is given for your information and guidance. For further information concerning long term storage of your tractor, please consult your authorised dealer.

TRACTOR STORAGE

Before storing the tractor for an extended period, the following precautions should be taken:

- Clean the tractor.
- Drain the engine and transmission/rear axle and refill with clean oil.
- Drain the fuel tank(s) and pour approximately two gallons of special calibrating fuel into the tank. Run the engine for at least 10 minutes to ensure complete distribution of the calibrating fuel throughout the injection system. See the next item before running the engine.
- Check the radiator coolant level. If the coolant is within 200 hours of the next change, drain, flush and refill the system. See operation 36 in section 4. Run the engine for one hour to disperse the coolant throughout the system.
- Lubricate all grease fittings.
- Using the tractor hydraulic system in Position Control, raise the lift linkage and support the lift arms in the raised position.
- Lightly coat all exposed hydraulic piston rods with petroleum jelly, e.g., power steering cylinder rams, lift assist rams, spool valves, etc.
- Remove the batteries and store in a warm, dry atmosphere. Recharge periodically.
- Raise the tractor and place supports under the axles to take the weight off the tyres.
- Cover the exhaust pipe opening.

PREPARATION FOR USE AFTER STORAGE

After extended storage, prepare the tractor for further use, as follows:

- Inflate the tyres to the correct pressure and lower the tractor to the ground.
- Refill the fuel tank(s).
- Check the radiator coolant level.
- Check all oil levels.
- Install fully charged batteries.
- Remove the exhaust pipe covering.
- Start the engine and check that all instruments and controls are functioning correctly. Using the tractor hydraulic system in Position Control, fully raise the lift linkage and remove the supports.
- Drive the tractor without a load to ensure that it is operating satisfactorily.

NOTES

SECTION 7
ACCESSORIES

This section of the Manual describes the function and operation of features that are available for your tractor as dealer installed accessories. Unless otherwise stated, these features may also be available as factory fitted options.

Maintenance requirements for these features will be found in Section 4 - Lubrication and Maintenance.

This subjects covered in this section are shown on the right. A comprehensive index is provided at the end of this book.

Subject	Page
Roof Beacon	7-2
Automatic Engine Shut Down	7-2
Hydraulic Trailer Brakes	7-3
Air-Operated Trailer Brakes	7-4
Walterscheid Hitch	7-9
Walterscheid Automatic Stabilisers	7-11
Sway Block Stabilisers	7-13
Drawbars and Towing Attachments	7-15

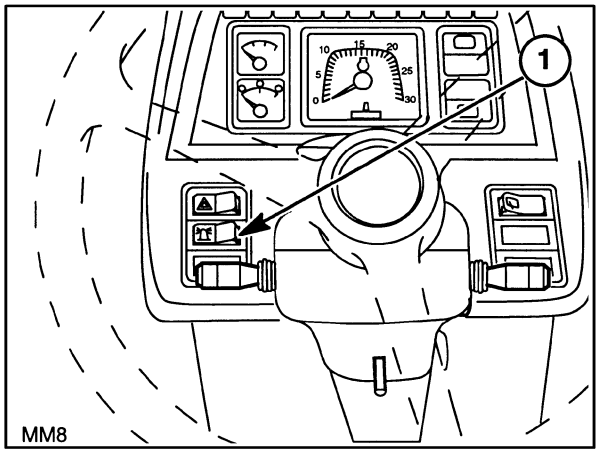
ROOF BEACON - Figures 3 and 4

Press in the left-hand side of the rocker switch (1) Figure 3, to provide power to the roof beacon socket outlet.

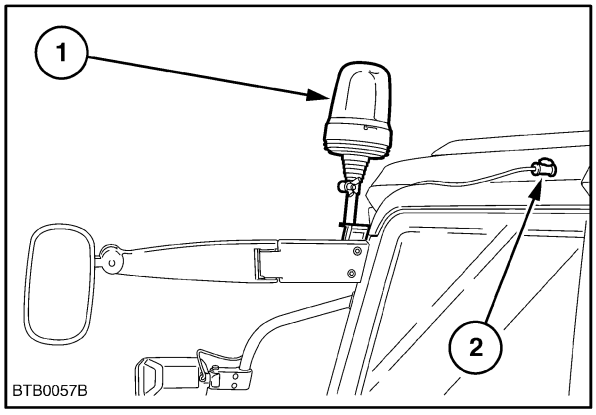
The roof beacon kit consists of a rotating beacon (1) Figure 4, support bracket and fitting hardware. Suitable for attachment to the left or right hand rear view mirror arm, the beacon icorporates a 'break away' flexible joint to help prevent damage if the lamp should strike an overhead object.

A socket (2) Figure 4, connected to the tractor electrical circuit, is provided on either side of the roof panel. The rotating beacon may be plugged into one of the sockets, as shown in Figure 4.

The power switch must be located in the aperture provided in the instrument console, as shown in Figure 3. Electrical connections for the switch are provided in the wiring loom.



3



4

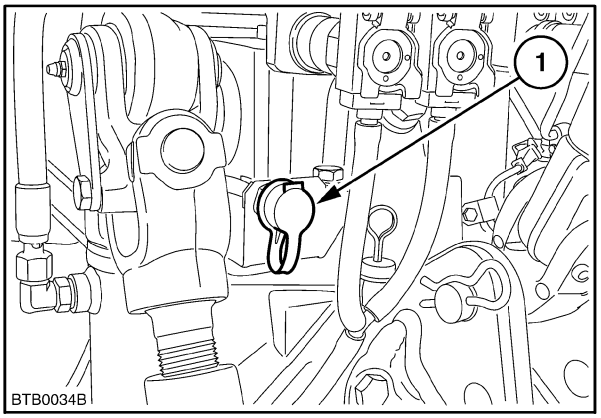
AUTOMATIC ENGINE SHUT DOWN (Dealer installed accessory)

An automatic engine shut down feature may be added to the computer module. This feature will automatically shut down the engine within 30 seconds if engine oil pressure falls below or engine coolant temperature rises above predetermined levels. This feature is useful to protect the engine of an unattended tractor carrying out stationary P.T.O. work. See your dealer if this feature is required.

⚠ WARNING ⚠

*The engine shut down feature is fully automatic and **cannot** be overridden by the operator. Consequently, this feature should only be used for stationary P.T.O. work where the tractor may be left unattended for a period.*

HYDRAULIC TRAILER BRAKES



5

HYDRAULIC TRAILER BRAKING SYSTEM (except Italy) - Figure 5

Hydraulic trailer brakes may be connected into the hydraulic system via a quick-release coupling (1) at the rear of the tractor.

NOTE: *The position of the trailer brake coupling may vary slightly from that shown, dependent upon the type of remote control valves installed.*

If the trailer brake hose is connected into the coupling the trailer brakes will be automatically applied when the footbrakes are used to stop the tractor.

⚠ WARNING ⚠

With the tractor engine off, hydraulic pressure cannot be applied to the trailer braking system. When parking the tractor/trailer combination apply the tractor and trailer parking brakes while the engine is still running. With the footbrakes locked together apply the parking brake, stop the engine and immediately block the wheels. Always lock the brake pedals together when a hydraulically braked trailer is attached to the tractor.

IMPORTANT: *It is essential that the brake pedals are locked together to ensure correct operation of trailer brakes, balanced operation of the tractor brakes and four wheel braking (four wheel drive tractors only).*

NOTE: *Always keep the dust-cap in place when the trailer brake coupling is not in use. It is a legal requirement in most countries that trailer brakes may only be connected to the tractor coupling by means of a compatible female coupling.*

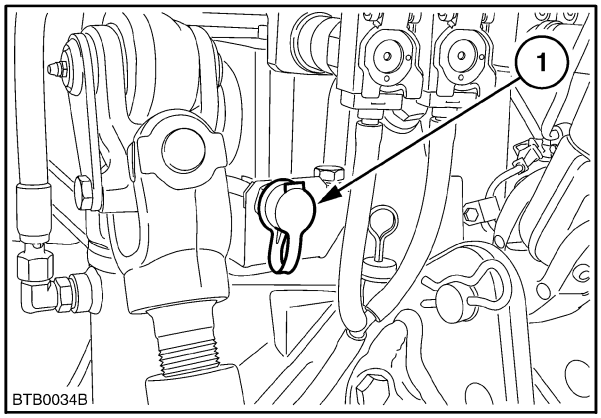
HYDRAULIC TRAILER BRAKING SYSTEM (Italy only) - Figure 6

The hydraulic trailer braking system on tractors for the Italian market function in a slightly different way to the universal system previously described.

If the trailer brake hose is connected into the coupling the trailer brakes will be automatically applied when the footbrakes are used to stop the tractor or when the tractor handbrake is applied when the engine is running. When the engine is switched off, the trailer brakes will remain applied.

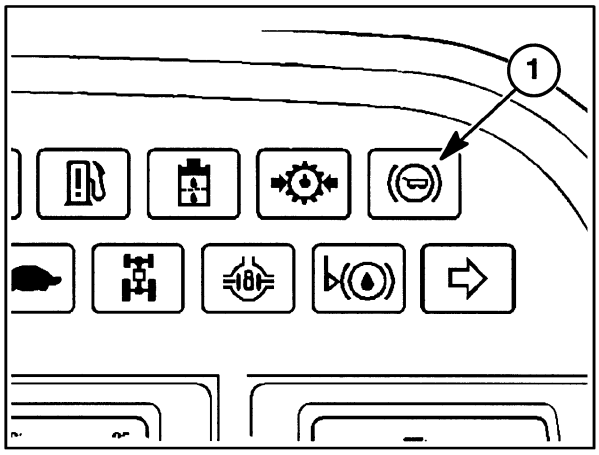
IMPORTANT: *It is essential that the brake pedals are locked together to ensure correct operation of trailer brakes, balanced operation of the tractor brakes and four wheel braking (four wheel drive tractors only).*

To release hydraulic pressure and free the trailer brakes, start the engine, depress both brake pedals and release the tractor handbrake.



6

Figure 7
NOTE: *The light (1), on the instrument panel will flash, accompanied by* ***critical alarm****, to indicate that hydraulic oil pressure to the trailer brake circuit is low. Stop the engine and investigate the cause.*



7

AIR-OPERATED TRAILER BRAKES

PNEUMATIC TRAILER BRAKING SYSTEM (except Italy) - Figures 8 To 16

⚠ WARNING ⚠

Single line trailer braking systems are designed for use up to a maximum speed of 25 km/h (15 MPH). Tractor/trailer combinations with dual line braking systems may be used at a higher speed but must at all times comply with local legal requirements. Gross train weight, i.e., tractor plus trailer(s) and/or individual trailer weight must not exceed that laid down in local regulations governing the use of trailers.

The following text covers operation of the air- operated trailer braking systems that may be installed as an alternative, or in addition to, hydraulically-actuated trailer brakes.

The system consists of an engine-driven air compressor, one or two air reservoirs, dependent upon type of system installed, a pressure gauge, control valves, two or three couplers and related pipework.

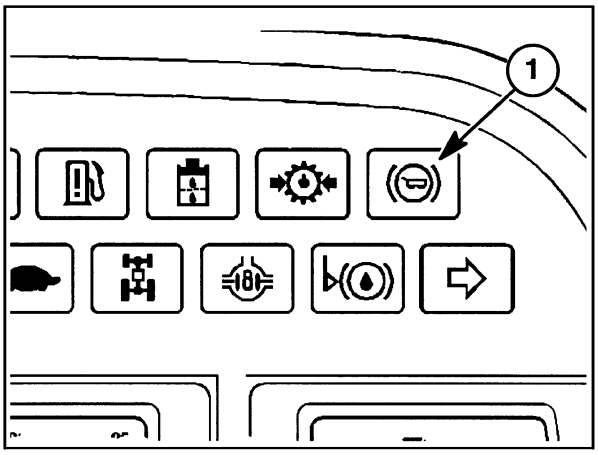
The couplers installed at the back of the tractor may be connected to single or dual line trailer braking systems. Either or both types may be installed. The air lines connected to the couplers are colour-coded black, red and yellow. The black line is used for a single line system, the red and yellow lines are used for dual line systems.

IMPORTANT: *The trailer brakes will only operate when* ***both*** *tractor brake pedals are applied. Therefore, always lock the brake pedals together when a trailer is attached to the tractor.*

NOTE: *The tractor handbrake is connected to the main control valve. Whenever the handbrake is applied, the trailer brakes are activated.*

Operation - Figure 8

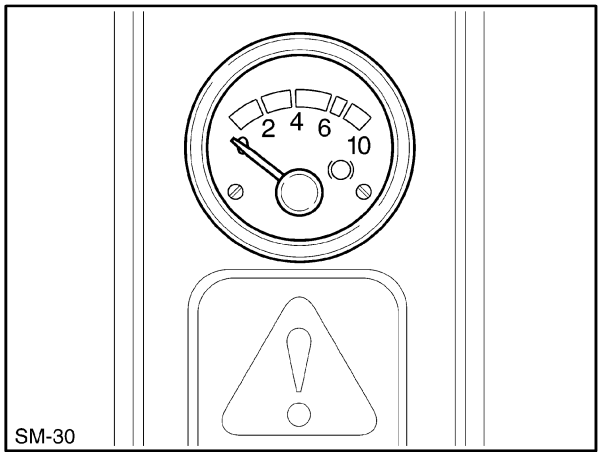
When starting the engine with a trailer connected into the tractor air brake system, chock the wheels and release the parking brake and footbrakes. The warning light (1) Figure 8, will illuminate until air pressure builds up to 4.5 - 5.5 bar.



8

Figure 9

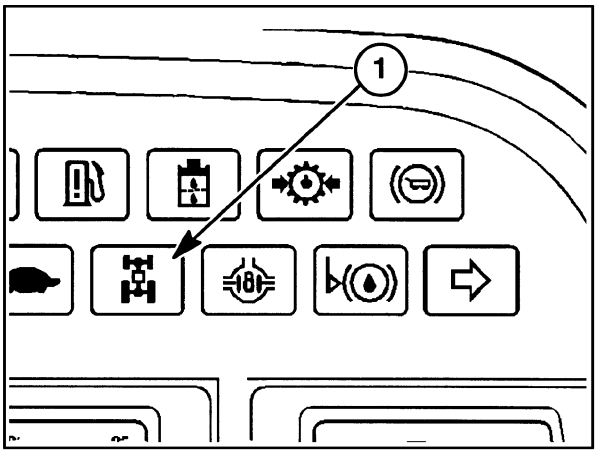
The pressure will continue to rise, as indicated by the gauge on the left-hand 'B' pillar, Figure 9, until approximately 7 to 8 bar is reached (the green segment of the gauge). This should be achieved within 3 minutes of start-up but may take longer, dependent upon the size of the trailer brake reservoir(s).



9

Once required pressure has been reached a loud 'pop' will be heard, signifying that the unload valve has opened to allow excess pressure to escape to atmosphere.

IMPORTANT: *Apply the footbrakes several times, ensuring that the pressure, as indicated by the gauge, drops as the brakes are applied and rises again when they are released. Never drive the tractor with the trailer brake warning light on.*



10

Figure 10

IMPORTANT: *When the footbrakes are applied ,with the handbrake off, ensure that the front wheel drive indicator light (1) Figure 10 illuminates and that all stop lights are functional.*

IMPORTANT: *Various types of trailer braking systems are available. Check the trailer manufacturers' instruction manual before making connections to the tractor air brake system.*

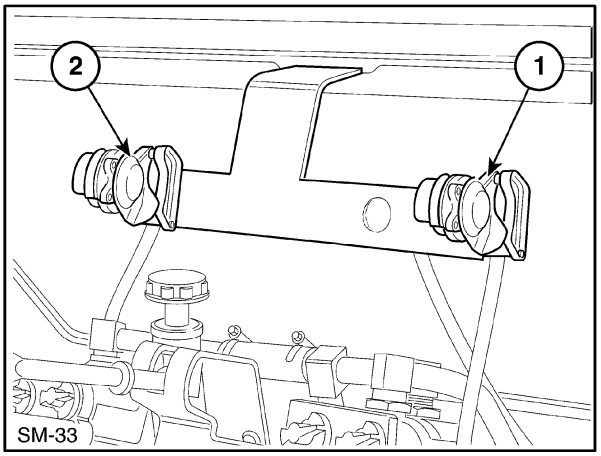
Clean the trailer and tractor connectors before coupling up the hose(s). Ensure that connections are secure. Check the trailer brakes regularly to ensure that they are functioning correctly.

⚠ CAUTION ⚠

Do not over use the brakes on steep down hill gradients. Use the same gear going down hill as you would use for going up the same hill.

Dual Line System - Figure 11

For a trailer with a dual line braking system, connect the supply line hose to the red coupler (1) and the control line hose to the yellow coupler (2).



11

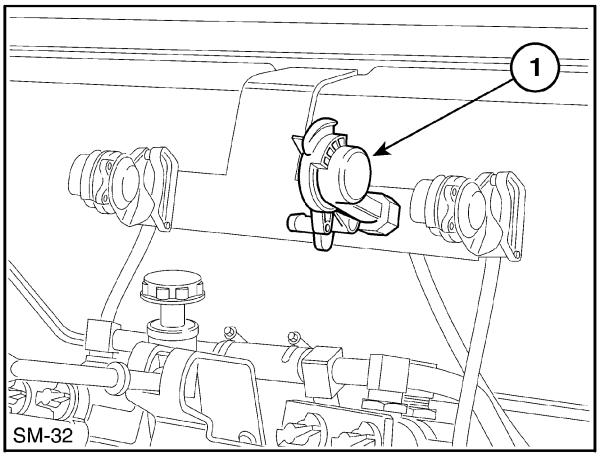
IMPORTANT: *The dual line system will only operate if both the red and yellow lines are connected.*

Red line (brake supply line) - (1): Air is supplied to the red coupler at full system pressure. This is the brake supply line and charges the reservoir(s) on the trailer. If the trailer braking system is disconnected from the tractor for any reason, the air pressure will fall to zero and the trailer brakes will be applied.

Yellow line (control line) - (2): As the tractor brakes are applied, increasing air pressure is supplied, via the yellow coupler, to the control valve on the trailer until full system pressure is generated. Application of the trailer brakes is proportional to the pressure applied to the tractor brake pedals.

Single Line System - Figure 12

If the trailer has a single line system an additional coupler is supplied. Connect the hose to the **black** coupler (1) Figure 12.



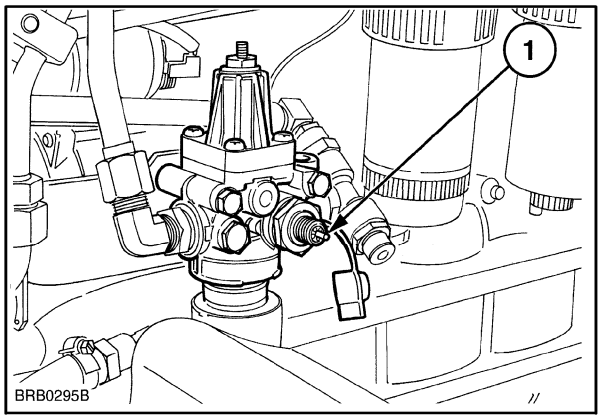
12

A pressure of 5.5 bar is available at the coupler at all times when the tractor brake pedals and parking brake are released. Application of the tractor brakes causes the pressure to drop to zero allowing the trailer brakes to be applied.

Auxiliary Air Supply - Figure 13

An auxiliary air supply is available for the purpose of inflating tyres, etc. The air supply operates at full system pressure - 7 or 8 bar (100 or 115 lbf. in^2) - dependent upon system installed. When not in use, ensure protective dust cap is fitted.

Always use a proprietary inflating gun, with gauge, when inflating tyres. Connect the air hose to the air outlet (1), located on the right-hand side of the engine, to the rear of the fuel filters.

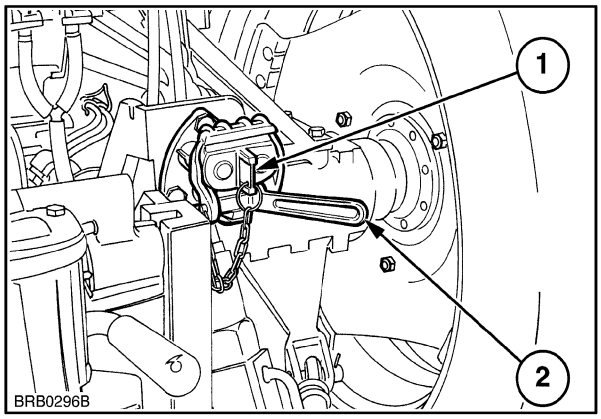


13

PNEUMATIC TRAILER BRAKING SYSTEM (Italy only) - Figure 14

This system operates in a similar manner to the dual line system, previously described, except that a combined dual coupler is utilised. Please read all the previous text relating to pneumatic trailer brakes plus the following:

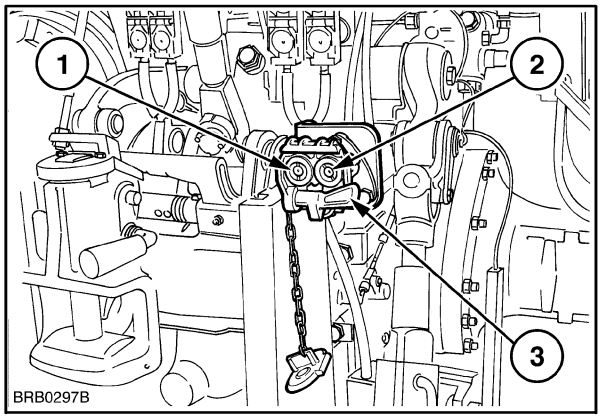
The coupler is protected by a metal cover. To remove the cover, press the handle (2) down. The handle is held in position by a stiff spring and some pressure is required to move it down to release the cover (1).



14

Connections - Figure 15

The lines to the couplers are colour-coded for ease of use. The supply line to the left-hand coupler (1) is red and the control line to the right-hand coupler (2) is yellow. The trailer hoses will have a male dual coupler. Press down the handle (3) and insert the trailer coupler. When the handle is released, it will lock the trailer and tractor couplers together.



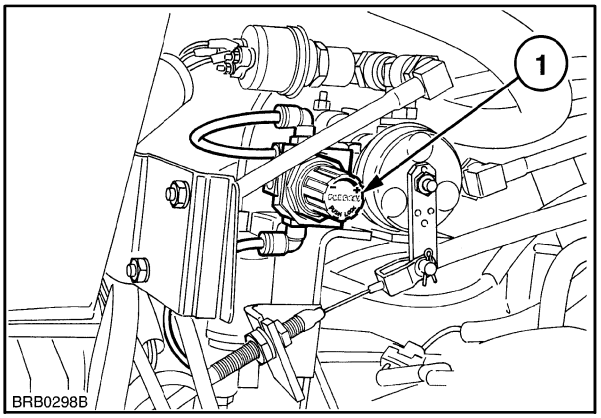
15

Tractor/Trailer Brake Bias Control - Figure 16

When the tractor leaves the factory, this control is set to allow maximum available braking effort to the trailer. Under most conditions, the control will remain in this position and will give well balanced braking.

Occasionally, with some trailers this setting may provide a greater braking bias to the trailer than is ideal. In this case the braking force to the trailer may be reduced slightly by turning the adjuster (1) in an anti-clockwise direction.

To turn the valve, it is first necessary to pull the knob out. After adjustment, push the knob in to lock the setting. The adjuster must be reset to the fully clockwise position when a different trailer is used.



16

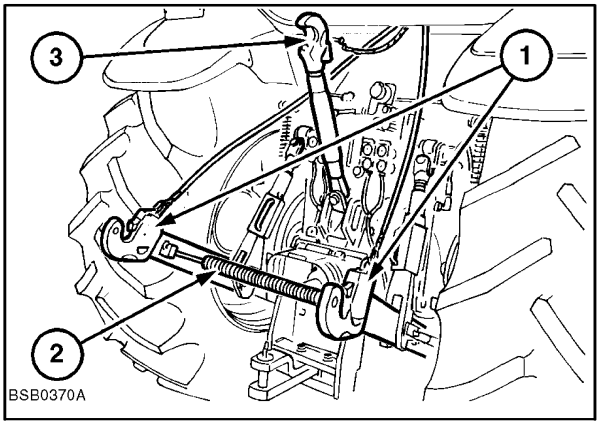
⚠ WARNING ⚠

The brake balance adjustment is extremely sensitive and should not be rotated more than one half turn before testing with the attached trailer fully loaded. If further adjustments are required, they should be carried out following the same procedure. Failure to do this may result in an imbalance between tractor and trailer braking forces if the valve is rotated too far in the anti-clockwise direction.

WALTERSCHEID HITCH - Figure 17

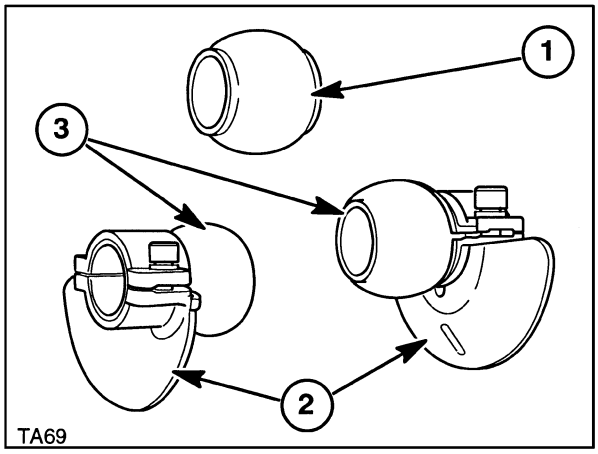
The Walterscheid hitch consists of an alternative pair of lower links (1) and an adjustable top link (2). The lower links and the top link have open claw ends that permit rapid coupling and uncoupling of implements without leaving the cab. The claws are equipped with self-locking latches to ensure positive retention of the tractor linkage to the implement. Cables are provided for attachment to the latches.

An adjustable spacer spring (2) is available as an accessory. The spring maintains the lower links at the width setting required to match that of the implement.



17

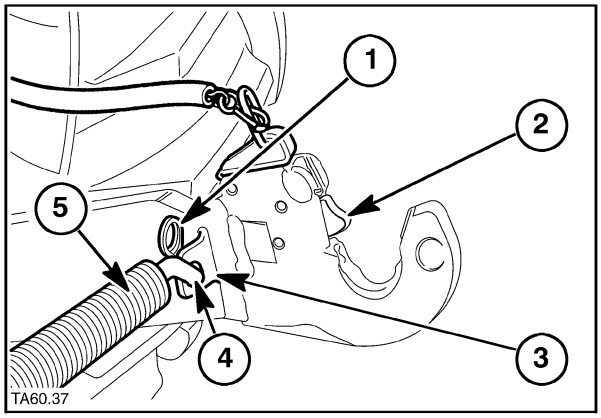
Figure 18
Three ball-bushings are supplied for installation on the implement, if required. The ball-bushing with projecting lips (1) should be installed on the implement upper hitch pin. The two plain ball-bushings (3) with their detachable guides (2) should be installed on the implement lower hitch pins.



18

Coupling Implement to Tractor - Figure 19
Adjust the stabilisers to maintain the tractor lower links at the correct distance apart so they align with the ball-bushings installed on the implement lower hitch pins. Alternatively, use the optional, adjustable spacer, if available. The spacer consists of a closed spring (5), with a rod (4) screwed into one end. Remove the 'R' clip (1) and disconnect the spacer rod from the bracket (3) on the right-hand lower link. Screw the rod into or out of the spring to shorten or lengthen the assembly.

Fully raise the top link. With the lower links fully lowered, the self-locking latches (2) in the operating position, as shown, reverse the tractor until the lower link claw couplers are beneath the implement hitch pins. The combination of large claw openings and the guides on the implement ball-bushes make accurate alignment of tractor to implement unnecessary.



19

Raise the lower links using the hydraulic lift lever until the claw couplers engage the ball-bushes. An audible click will be heard as the self-locking latches engage the implement ball-bushes. Lower the top link claw onto the upper implement ball-bush and press down until the latch is heard to engage. Increase or decrease top link length, as necessary.

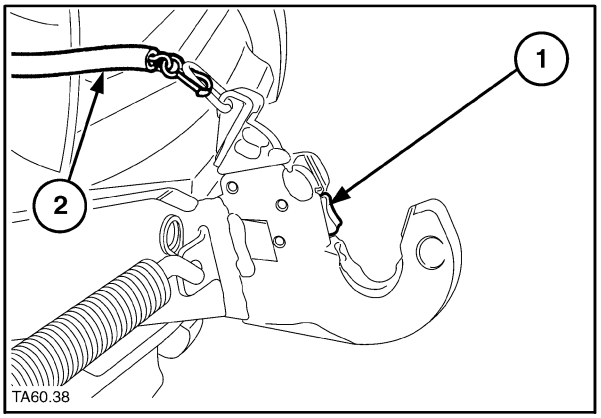
The implement supports, where fitted, may now be removed or retracted and the implement supported on the 3-point linkage.

Uncoupling Implement from Tractor - Figure 20
Using the hydraulic lift control lever, fully lower the implement to the ground ensuring that it cannot fall when disconnected from the tractor. Use the implement supports (where fitted).

Pull the release cable on the top link to release the claw from the implement hitch.

Pull the release cable (2), on both lower links. The lever will lock in position with the latch (1) retracted, as shown. This will allow the links to clear the ball-bushings on the implement lower hitch pins when the links are lowered fully. Fully lower the lower links and drive the tractor forward, clear of the implement.

NOTE: *Ensure the release cables do not foul wheels, or moving parts of the hydraulic linkage or implement. When not in use, secure the cables to the rubber strap on the rear right-hand side of the cab frame.*



20

WALTERSCHEID AUTOMATIC STABILISERS (where fitted)

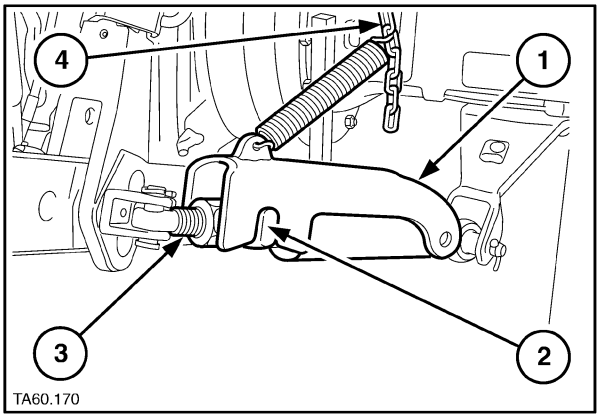
- Figures 21 and 22

Walterscheid telescopic stabilisers may be fitted in place of the standard telescopic stabilisers, described previously.

⚠ WARNING ⚠

Never operate steerable equipment unless the stabilisers are installed and correctly adjusted to prevent excessive lateral movement.

The stabilisers will control the sway of the lower links and attached equipment when in work or when being transported. This is especially important when operating on slopes or near fences, walls or ditches and with certain implements. Check your Implement Operator's Manual.



21

Figure 21

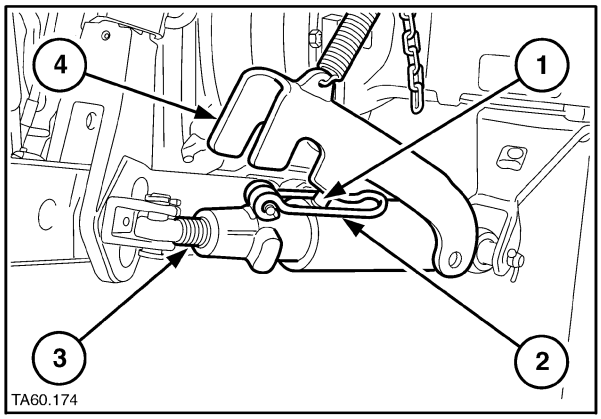
Each stabiliser consists of a telescopic tube assembly internally threaded at the rear end. The tube assembly is attached to a mounting bracket bolted to the outer ends of the rear axle housing.

An externally threaded rod (3) is attached to the lower links. The threaded rod engages with the screwed thread in the tube assembly and the overall length of the assembly is determined by screwing the rod in or out, as required.

An adjustable chain (4) is attached, at one end, to the rear fender and at the other end, via a spring, to a hinged cover (1) on the telescopic part of the stabiliser. A lug (2) on the telescopic part of the stabiliser engages a notch in the cover.

When the chain is correctly adjusted it will be slack when the lower links are raised from the operating position, so allowing the cover to drop down over the lug on the stabiliser. When the cover is down, as shown, the stabiliser is locked at the preset length. The lower links are, therefore, retained at a set distance apart, preventing them (and attached equipment) from swaying.

However, when the 3-point hitch is lowered into the work position, the chain becomes taut and lifts the cover from the stabiliser allowing it to telescope freely. The stabilisers (and implement) will then sway when engaged in the ground. This feature is useful as it provides greater implement control when turning on the headlands of a field.



22

Adjusting the Stabilisers - Figure 22

In practice, the implement should be attached to the three-point linkage with the cover (4) on both stabilisers raised, so as to allow the stabilisers to telescope freely.

Lift the locking/adjusting lever (2) up over the peg (1) so that the lever is at right-angles to the stabiliser. Turn the telescopic section, by means of the lever, so that the threaded section (3) screws into or out of the stabiliser. When the length is satisfactory, i.e., the notch in the cover aligns with the lug on the stabiliser, lower the lever back down over the peg and close the cover.

The chain should then be adjusted, by placing the appropriate link over the attaching hook, so that the cover on the stabiliser is lifted when the implement is lowered into work.

IMPORTANT: *When setting the stabiliser length to provide sway, ensure that there is no possibility of the rear tyres fouling the stabilisers or lower links.*

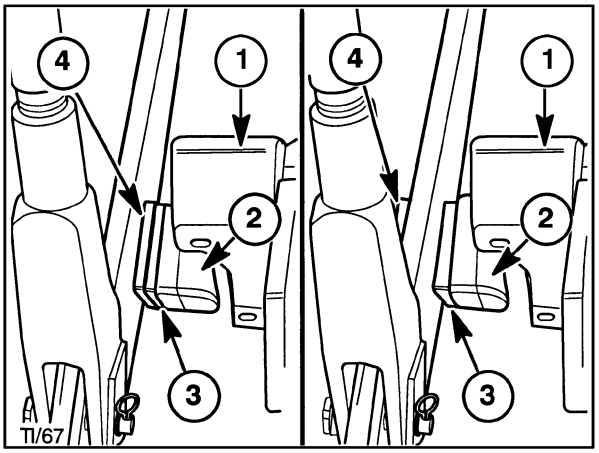
SWAY BLOCK STABILISERS (where fitted) - Figures 23 and 24

Sway block stabilisers may be installed as an alternative to telescopic stabilisers and will control the sway of the lower links and attached equipment when in work or when being transported. This is especially important when operating on slopes or near fences, walls or ditches and with certain implements. Check your Implement Operator's Manual.

⚠ WARNING ⚠

Never operate steerable equipment unless the stabilisers are installed and correctly adjusted to prevent excessive lateral movement.

Sway blocks consist of reversible blocks (1) bolted to either side of the drawbar hanger. A steel wear pad (2) bolted to the inner surface of each lower link, contacts the sway block to prevent excessive sway (lateral movement) of the lower links. The thickness of the pad (and therefore the degree of sway) is controlled by two spacer shims of 8 mm and 10 mm thickness, respectively.



23

The positioning of the shims relative to the pad depends upon the required width setting of the lower links (to suit the attached implement) or the degree of sway required. Additionally, if your tractor is equipped with mechanical lower link sensing then there will be a spacer installed on the outside or the inside of the lower link mounting point to control hydraulic system sensitivity (see page 3-35). The position of the spacers will also affect the positioning of the wear pad shims.

Shim/Wear Pad Position - Figure 23

The left-hand side of Figure 23 shows both spacer shims (3) and (4) installed between the wear pad (2) and the lower link (1). This will increase the distance between the lower links to suit a wider implement.

The right-hand side of Figure 23 shows the 8 mm shim (4) on the outer surface of the lower link with the 10 mm shim (3) installed between the pad and the lower link. Alternatively, the shims may be omitted altogether to reduce the distance between the lower links when operating with a narrower implement.

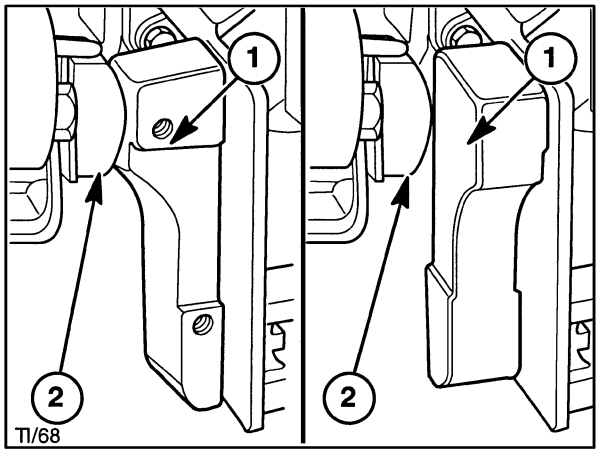
Sway Block Position - Figure 24

To allow lateral movement of the lower links (and attached equipment) in both the operating and transport positions, attach both sway blocks (1) so that the flat surface faces the wear pad (2) as shown in the right-hand side of Figure 24.

When it is desirable to have sideways movement of the equipment in the operating position, but remain rigid in the transport position, remove the bolts securing the sway blocks to the drawbar hanger and relocate the sway blocks (1) so that the curved surface faces the wear pad (2) as shown in the left-hand side of Figure 24.

This will allow the implement to sway when the lower links are lowered into the working position but become rigid when raised.

IMPORTANT: *When setting the sway blocks to provide lateral movement, ensure that there is no possibility of the lower links or implement contacting the rear tyres. Ensure that there is sufficient clearance between the wear pads and the sway blocks to allow the 3-point linkage to raise and lower without the possibility of the lower links binding or becoming bent.*



24

DRAWBARS AND TOWING ATTACHMENTS

NOTE: *Before attaching trailed equipment to the tractor, read the following text carefully.*

ATTACHING/DETACHING TRAILED EQUIPMENT

IMPORTANT: *Regulations in some areas require brakes on towed equipment when operating on the public highway. Before travelling on public roads, make sure you comply with legal requirements. In the U.K. you are required to comply with the Road Vehicles (Construction and Use) Regulations - latest edition.*

To attach the tractor to trailed equipment and implements:

1. Ensure that the implement is at draw bar height.
2. Slowly inch rearwards to allow the drawbar and implement hitch to align.
3. Apply the parking brake and stop the engine.
4. Insert the hitch pin and ensure that the retainer is in the latched position.

IMPORTANT: *When attaching mounted or semi-mounted equipment to the 3-point linkage or when attaching trailed equipment to the drawbar or hitch, ensure that there is adequate clearance between the implement and the tractor. Semi-mounted or trailed equipment may interfere with the tractor rear tyres. If necessary, adjust steering stops (four wheel drive only), sway blocks or stabilisers.*

NOTE: *For implements that require hitch extensions or interfere with the tractor clevis, remove and store the clevis and hitch pin.*

Always use a safety chain installed between the tractor and implement hitch when transporting equipment on the highway. See page 7-19.

Observe the following precautions for towing equipment not equipped with brakes:

- Do not tow equipment weighing more than twice the tractor weight.
- Do not exceed 10 MPH (16 km/h) if towed equipment weighs more than the tractor.
- Do not exceed 20 MPH (32 km/h) while towing equipment that weighs less than the tractor.

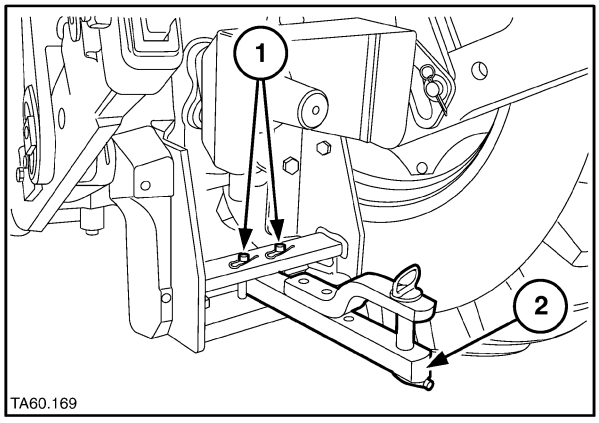
SWINGING DRAWBARS - Figures 25 to 29

Two types of swinging drawbar are available. The sliding type is illustrated in Figure 25. This drawbar may be installed as part of a tow hitch or as an independent unit.

The roller type, shown in Figure 28, is recommended when heavy draft, trailed equipment is used for extended periods. This drawbar is mounted on rollers and offers additional turning ease when compared with the sliding type.

Sliding Type Swinging Drawbar – Figures 25 and 26

The drawbar (2) pivots about a single pin at the front end so as to allow the rear of the drawbar to swing the full width of the hanger. By inserting the swing limiter pins (1) in the appropriate holes, restricted movement of the drawbar is permitted. Alternatively, the drawbar can be pinned in any one of three positions by insertion of the pins in the appropriate holes. In Figure 25, the drawbar is shown pinned in the central position to prevent swinging.



25

Pin the drawbar to prevent swinging when pulling equipment which requires accurate positioning and when transporting equipment.

Allow the drawbar to swing when pulling ground engaging equipment which does not require accurate positioning. This will make steering and turning easier.

⚠ WARNING ⚠

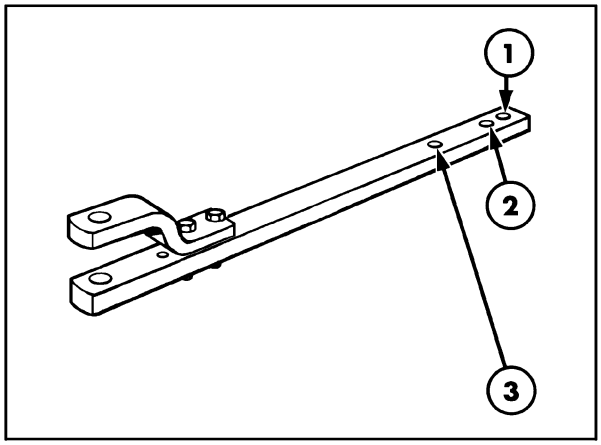
Always secure the drawbar to prevent swinging when transporting equipment or when operating any but ground engaging equipment.

The drawbar is adjustable for height and projection relative to the end of the P.T.O. shaft. To vary the height of the drawbar/implement hitch point, remove the drawbar and invert it.

All Countries Except North America

The front securing pin may be inserted in one of three holes in the drawbar to vary the P.T.O. shaft to hitch point distance. See Figure 26 and the following table:

Hole (see Fig. 26)	P.T.O. Shaft to Drawbar Hitch Point	Maximum Static Downward Load
Drawbar clevis uppermost		
1	406 mm (16 in.)	1440 kg (3175 lb.)
2	356 mm (14 in.)	1680 kg (3700 lb.)
3	243 mm (9.6 in.)	2575 kg (5675 lb.)
Drawbar clevis underneath		
1	406 mm (16 in.)	1045 kg (2300 lb.)
2	356 mm (14 in.)	1225 kg (2700 lb.)
3	243 mm (9.6 in.)	1305 kg (2875 lb.)



26

Use of hole 1 is required for 1000 rev/min P.T.O. operations and hole 2 for 540 rev/min P.T.O. operations.

When towing equipment exerting high static downward forces, such as two-wheeled trailers, etc., use the close-coupled position - hole 3.

North America only

The front securing pin may be inserted in one of four holes in the drawbar to vary the P.T.O. shaft to hitch point distance. See Figure 27 and the following table:

Hole (see Fig. 27)	P.T.O. Shaft to Drawbar Hitch Point	Maximum Static Downward Load
1	406 mm (16 in.)	1140 kg (2510 lb.)
2	356 mm (14 in.)	1680 kg (3700 lb.)
3	304 mm (12 in.)	1935 kg (4265 lb.)
4	228 mm (9 in.)	2575 kg (5675 lb.)

Use of hole 1 is required for 1000 rev/min P.T.O. operations and hole 2 for 540 rev/min P.T.O. operations.

When towing equipment exerting high static downward forces, such as two-wheeled trailers, etc., use the close-coupled positions - holes 3 or 4.

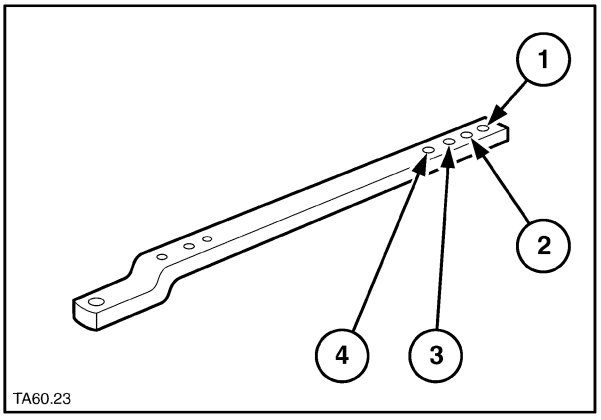
All Drawbars

WARNING

Do not pull from the lower links with the links above the horizontal position. Always use the drawbar, pick-up hitch or lower links in the lowered position for pull-type work, otherwise the tractor may overturn rearwards.

NOTE: *When supporting equipment on the drawbar ensure that the total weight on the rear axle does not exceed the maximum static downward load or the rear tyre load capacity, whichever is the lower (see* Tyre Pressures and Permissible Loads *at the end of Section 3).*

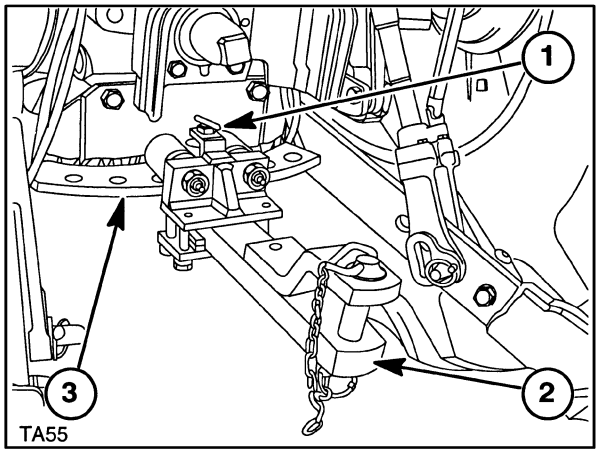
IMPORTANT: *When transporting equipment on the highway it is recommended that a safety chain having a tensile strength equal to the gross weight of the implement be installed between the tractor and implement hitch. See* Safety Chain *on page 7-19.*



27

Roller Type Swinging Drawbar – Figures 28 and 29

The drawbar (2) Figure 28, pivots about a single pin at the front end so as to allow the rear of the drawbar to swing the full width of the hanger. By inserting the swing limiter pin (1) in the appropriate hole and through the drawbar, the drawbar can be pinned in any one of seven positions. Alternatively, the drawbar may be allowed to swing the full width of the hanger (3).



28

Pin the drawbar to prevent swinging when pulling equipment which requires accurate positioning and when transporting equipment. Allow the drawbar to swing when pulling ground engaging equipment which does not require accurate positioning. This will make steering and turning easier.

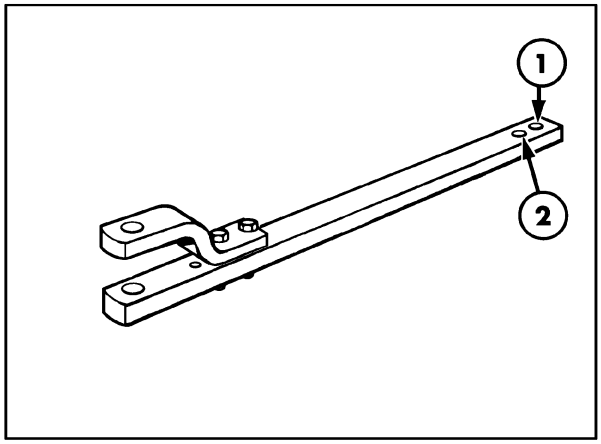
⚠ WARNING ⚠

Always secure the drawbar to prevent swinging when transporting equipment or when operating any but ground engaging equipment.

The drawbar is adjustable for height and projection relative to the end of the P.T.O. shaft. To vary the height of the drawbar/implement hitch point, remove the drawbar and invert it.

The front securing pin may be inserted in one of two holes in the drawbar to vary the P.T.O. shaft to hitch point distance. See Figure 29 and the following table:

Hole (see Fig. 29)	P.T.O. Shaft to Drawbar Hitch Point	Maximum Static Downward Load
Drawbar clevis uppermost		
1	406 mm (16 in.)	1360 kg (2995 lb.)
2	356 mm (14 in.)	1630 kg (3590 lb.)
Drawbar clevis underneath		
1	406 mm (16 in.)	910 kg (2005 lb.)
2	356 mm (14 in.)	1065 kg (2345 lb.)



29

Use of hole 1 is required for 1000 rev/min P.T.O. operations and hole 2 for 540 rev/min P.T.O. operations.

When towing equipment exerting high static downward forces, such as two-wheeled trailers, etc., use hole 2.

⚠ WARNING ⚠

Do not pull from the lower links with the links above the horizontal position. Always use the drawbar, pick-up hitch or lower links in the lowered position for pull-type work, otherwise the tractor may overturn rearwards.

NOTE: *When supporting equipment on the drawbar ensure that the total weight on the rear axle does not exceed the maximum static downward load or the rear tyre load capacity, whichever is the lower (see* Tyre Pressures and Permissible Loads *at the end of Section 3).*

IMPORTANT: *When transporting equipment on the highway it is recommended that a safety chain having a tensile strength equal to the gross weight of the implement be installed between the tractor and implement hitch. See following text and Figure 30.*

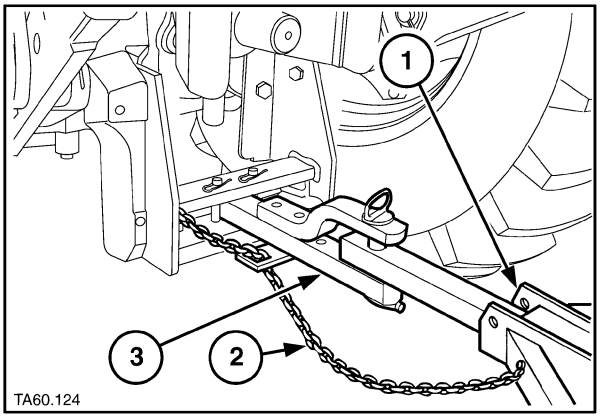
SAFETY CHAIN - Figure 30

When towing implements on public roads, use a safety chain (2) with a tensile strength equal to or greater than the gross weight of the implement to be towed. This will control the implement (1) in case the drawbar (3) and implement become disconnected.

After attaching the safety chain, make a trial run by driving the tractor to the right and to the left for a short distance to check the safety chain adjustment. If necessary, re-adjust to eliminate a tight or loose chain.

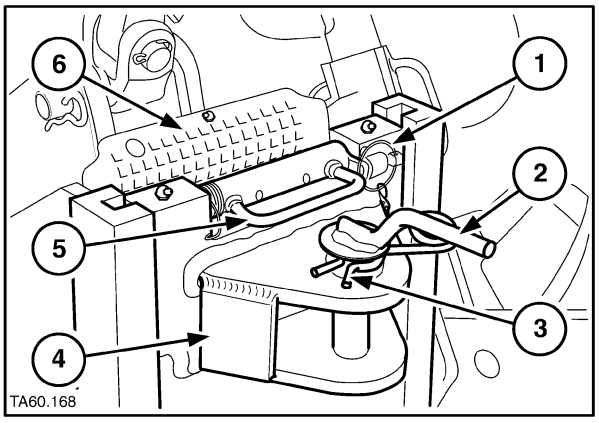
Check the implement operator's manual for implement weight and attaching hardware specifications.

Safety chains, attaching hardware and chain guide are available from your authorised dealer.



30

REAR TOW HITCH (where fitted) - Figures 31 to 41



31

Description

Various rear tow hitch options are available. All versions consist of a fabricated steel frame bolted to the rear axle centre housing. A tow pin is provided, adjustable for height.

The slider type frame is shown in Figures 32 and 33. Rotating pins in the tow pin assembly engage in notches in the frame to secure the tow pin at the required height. With this type of frame, a second, fixed tow pin (piton) is available as an option. The piton is installed at the bottom of the assembly.

Four types of tow pin assembly are available :-

- Non-swivelling tow pin.
- Heavy duty non-swivelling tow pin (dealer installed accessory). See Figure 33.
- Swivelling tow pin - manual operation. See Figure 37.
- Swivelling tow pin - auto operation. See Figure 39.

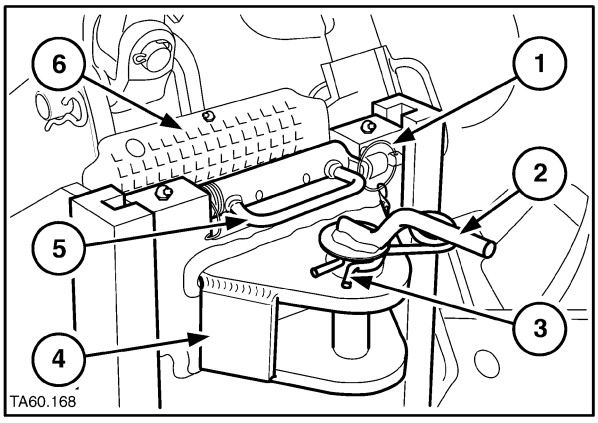
A swinging drawbar may also be provided as part of the assembly. See 'Sliding Type Swinging Drawbar' on page 7-16 for details of drawbar operation.

NOTE: *The tow hitch is designed primarily for use with four wheel trailers which do not place a heavy downward load on the tow pin. Observe the maximum static downward loads quoted in the text.*

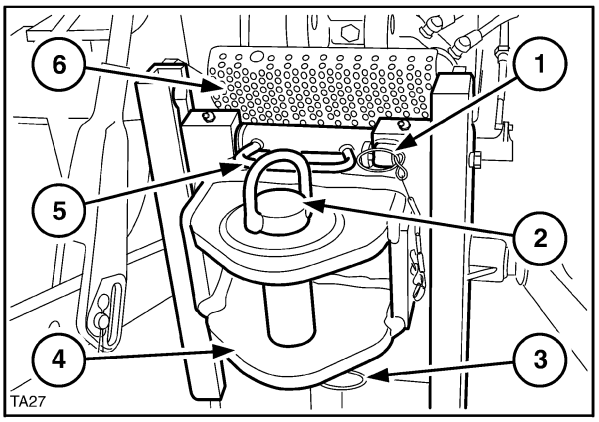
Slider Frame with non-swivelling Tow Pins (dealer installed accessory) – Figures 32 to 35

The tow hitches shown are equipped with a height adjustable, non-swivelling, tow pin assembly. The standard tow pin is shown in Figure 32. Figure 33 shows the heavy duty tow pin.

Remove the securing clip (1) and lift the handle (5) to the vertical position. Lifting the handle will rotate the pins and disengage them from the notches in the frame. Using both hands on the handle (5) lift or lower the tow pin assembly (4), as required. When at the required height, support the tow pin with one hand and lower the handle to the horizontal position, as shown in Figures 32 and 33. The pins will rotate and re-engage the notches in the frame. Lower the P.T.O. guard (6).

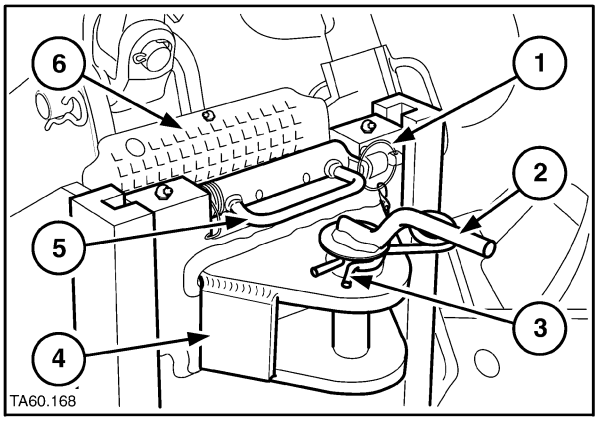


32



33

To attach a trailer drawbar to the tow pin, remove the 'R' clip (3) from the tow pin and lift out using the handle (2). Re-insert the tow pin so that it passes through the eye of the trailer drawbar. Replace the 'R' clip.

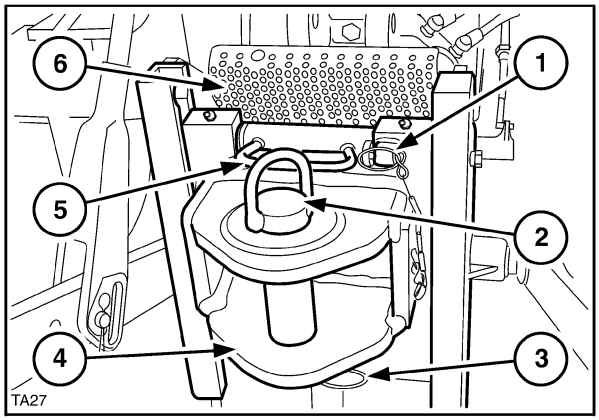


34

NOTE: *The static downward load on the tow pin must not exceed the rear tyre load capacity or the following values, whichever is lower. (See* Tyre Pressures and Permissible Loads *at the end of Section 3).*

Standard tow pin (Fig. 34)	*1500 kg (3300 lb.)*
Category D2 tow pin (Fig. 35)	*2000 kg (4400 lb.)*

NOTE: *A Category D3 tow pin (with housing) is available as a dealer installed accessory. The static downward load on the Category D3 tow pin should not exceed 2500 kg (5500 lb.) or the rear tyre load capacity, whichever is lower. (See* Tyre Pressures and Permissible Loads *at the end of Section 3).*

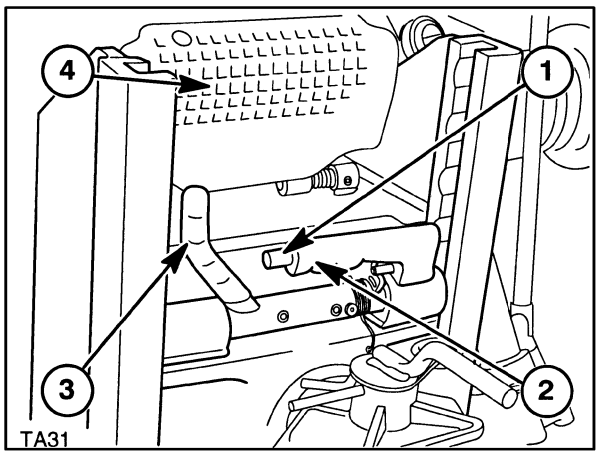


35

Slider Frame with Swivelling Tow Pins – Figures 36 to 40

The tow hitches shown are equipped with a height adjustable, swivelling tow pin assembly with manual or auto operation.

With reference to Figure 36, adjust the height of the tow pin assembly, as follows:



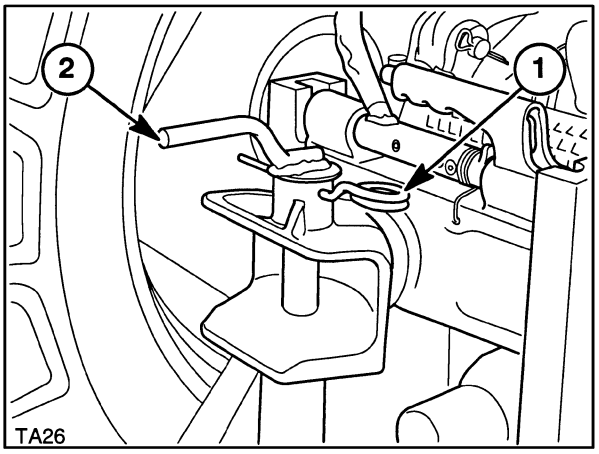
36

Grasp the handle (2) with the right hand. Press and hold in the button (1) to release the locking mechanism. Pull the handle (3) down to the horizontal position with the left hand and release the push button to lock the handle (3) in the horizontal position. Lowering the handle will rotate the pins and disengage them from the frame. Using both handles, lift or lower the complete tow pin assembly. When at the required height, hold in the push button and lift the left-hand handle up to the vertical position, as shown in Figure 36. The pins will rotate and re-engage the notches in the frame. Lower the P.T.O. guard (4).

WARNING

Before attaching a trailer, ensure that the pins are fully engaged in the notches, i.e. the handle (3) Figure 36, is in the vertical position. The tow pin assembly must not rest on the P.T.O. guard or on the bolt heads at the end of the slider guides.

To attach a trailer drawbar to the upper tow pin, see the following text:

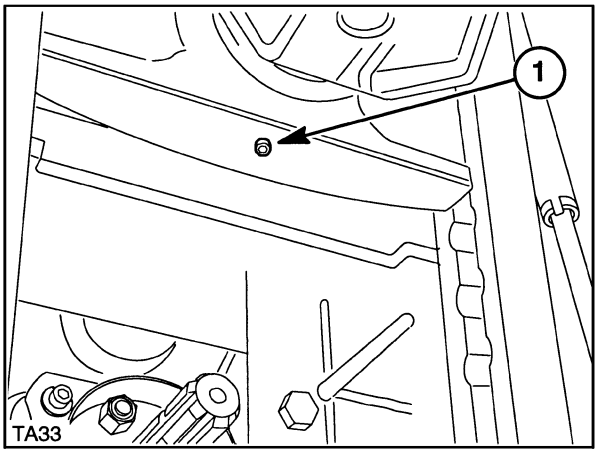


37

Swivelling Tow Pin - Manual Engagement - Figures 37 and 38

To attach a trailer drawbar to the tow pin, remove the 'R' clip (1) Figure 37, from the tow pin and lift out using the handle (2). Re-insert the tow pin so that it passes through the eye of the trailer drawbar. Replace the 'R' clip.

The tow pin may be allowed to swivel after loosening the socket-headed screw (1) Figure 38 on the underside of the tow pin assembly. This feature will permit a trailer with a non-swivelling drawbar to articulate relative to the towing tractor.

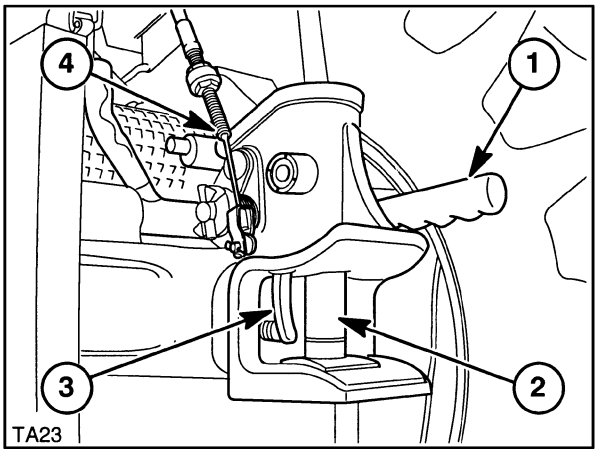


38

NOTE: *The static downward load on the tow pin must not exceed 2000 kg (4400 lb.) or the rear tyre load capacity, whichever is lower. (See* Tyre Pressures and Permissible Loads *at the end of Section 3).*

Swivelling Tow Pin - Auto Engagement - Figures 39 and 40

The tow pin (2) Figure 39, is spring-loaded in the engaged (down) position, as shown. To attach a trailer to the tow pin, lift the release lever (1) to the vertical position to retract the tow pin up into it's housing.



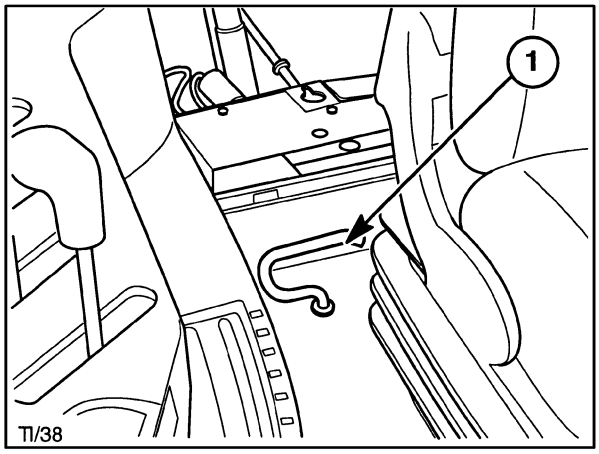
39

The release lever is connected by the cable (4) to a handle in the cab. This will permit trailer attachment without leaving the cab. Pull up the handle (1) Figure 40 to actuate the cable release and retract the tow pin up into it's housing.

The pin will stay in the raised position until the trailer drawbar is located beneath it. The eye of the drawbar will contact the trip lever (3) Figure 39 and cause the pin to drop down into the engaged position. Alternatively, the tow pin will drop down into the engaged position if the lever (1) is pulled down.

WARNING

Do not attempt to trip the lever by hand as the fingers may be trapped by the action of the spring-loaded tow pin.

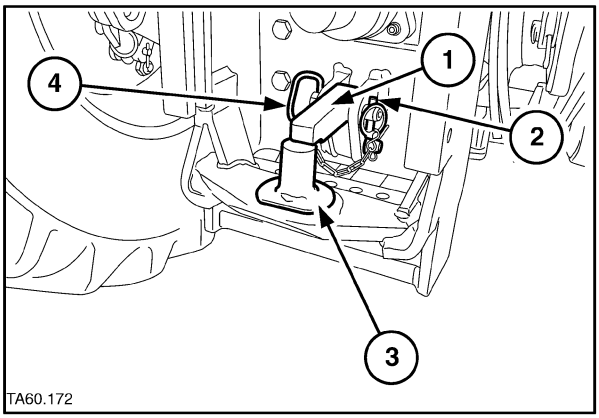


40

The tow pin may be allowed to swivel after loosening the socket-headed screw (1) Figure 38 on the underside of the tow pin assembly. This feature will permit a trailer with a non-swivelling drawbar to articulate relative to the towing tractor.

IMPORTANT: *Do not allow the tractor tow pin to swivel if the trailed equipment is equipped with a swivelling tow pin connector.*

NOTE: *The static downward load on the tow pin must not exceed 2000 kg (4400 lb.) or the rear tyre load capacity, whichever is lower. (See* Tyre Pressures and Permissible Loads *at the end of Section 3).*



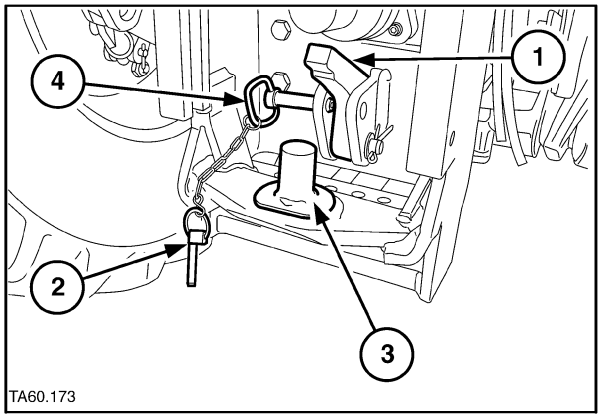
41

Fixed Tow Pin (Piton) - Figure 41 and 42

An optional fixed tow pin (piton) may be provided at the bottom of the assembly.

To attach a trailer to the piton, remove the linch pin (2) and withdraw the retaining pin (4). Lift the security latch (1) and lower the eye of the trailer drawbar over the piton (3). Drop the security latch down, re-insert the retaining pin and secure with the linch pin. The security latch will ensure that the trailer cannot become accidentally detached from the piton

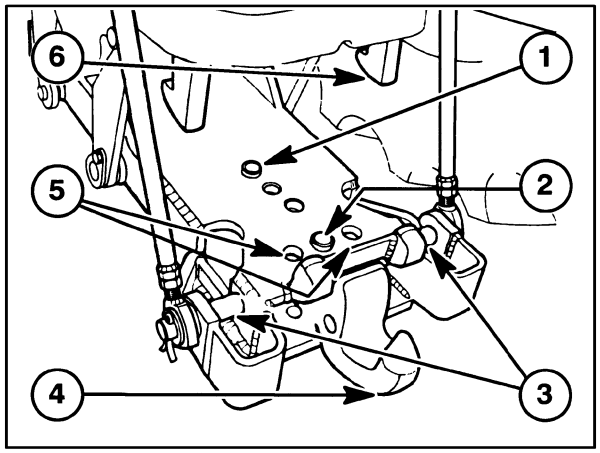
NOTE: *The static downward load on the piton must not exceed 3000 kg (6600 lb.) or the rear tyre load capacity, whichever is lower. (See* Tyre Pressures and Permissible Loads *at the end of Section 3).*



42

AUTOMATIC PICK-UP HITCH AND DRAWBAR (where fitted) - Figures 43 to 45

The automatic pick-up hitch is of the 'swing back' type (Figure 43) that moves rearwards as it is lowered. This type provides improved visibility of the hook from the operator's seat and, therefore, is easier to align with the implement drawbar.

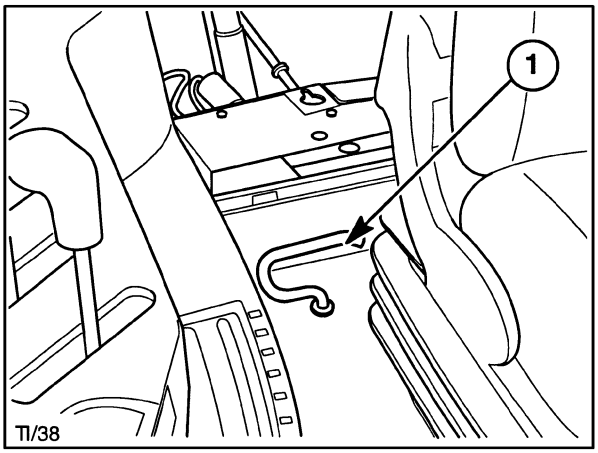


43

The pick-up hitch is raised and lowered by means of the tractor hydraulic system and is fully self-supporting when locked in the operating (raised) position.

To connect an implement to the pick-up hitch, select Position Control and pull the hydraulic lift control lever back until the 3-point linkage is supporting the weight of the hitch.

To free the hitch, pull and hold up the release handle (1) Figure 44, to free the hitch and then lower the hitch to the ground by means of the lift control lever.



44

With reference to Figure 43, position the tractor so that the hitch hook (4) is beneath the eye of the implement drawbar eye and, using the lift control lever, raise the hitch until an audible click indicates the locking latches (6) have engaged the cross tubes (3).

IMPORTANT: *Ensure that the height limit control is at the maximum height position. Failure to observe this may result in the hitch failing to latch correctly.*

Push the lift control lever forward so that the weight of the pick-up hitch (and attached implement) is supported by the locking latches.

NOTE: *The maximum static downward load on the hitch hook must not exceed 3000 kg (6610 lb.)*

The pick-up hitch hook is reversible and has a drawbar clevis on the other end. The combined hook and drawbar is secured to the hitch hanger by means of two pins.

With reference to Figure 43, to change from the hitch hook mode to drawbar, lower the pick-up hitch, extract the two securing pins (1) and (2) and withdraw the combined hitch hook/drawbar assembly (4).

Re-install the assembly, hook first, with the hook on its side and secure with the pins. Two additional holes (5) Figure 43, are provided in the hanger for the rear securing pin (2) so the drawbar may be offset to the left or right of the centre line.

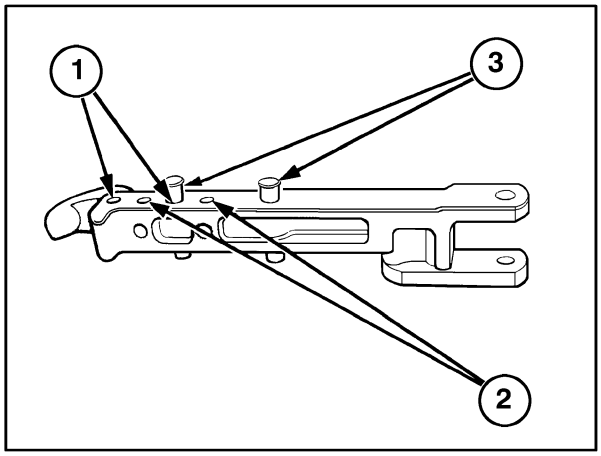
IMPORTANT: *Never raise or lower the pick-up hitch when in the drawbar mode with a trailer attached.*

The drawbar (Figure 45) may be inverted to vary the height of the drawbar/implement hitch point.

There are five holes in the drawbar. By inserting the two securing pins in the appropriate pair of holes (1), (2) or (3), a choice of implement/drawbar hitch points relative to the end of the P.T.O. shaft may be achieved. See Figure 45 and the following table for hitch point position and maximum permitted static downward load on the drawbar:

Holes (see Fig. 45)	P.T.O. Shaft to Drawbar Hitch Point	Maximum Static Downward Load
Drawbar clevis uppermost		
1	406 mm (16 in.)	1500 kg (3300 lb.)
2	356 mm (14 in.)	1650 kg (3630 lb.)
3	256 mm (10 in.)	2400 kg (5280 lb.)
Drawbar clevis underneath		
1	406 mm (16 in.)	1500 kg (3300 lb.)
2	356 mm (14 in.)	1650 kg (3630 lb.)
3	256 mm (10 in.)	2180 kg (4800 lb.)

When towing equipment exerting high static downward forces, such as two-wheeled trailers, etc., always use the close-coupled drawbar position (the pair of holes 3 in Figure 45). Alternatively, change to the hitch hook mode.



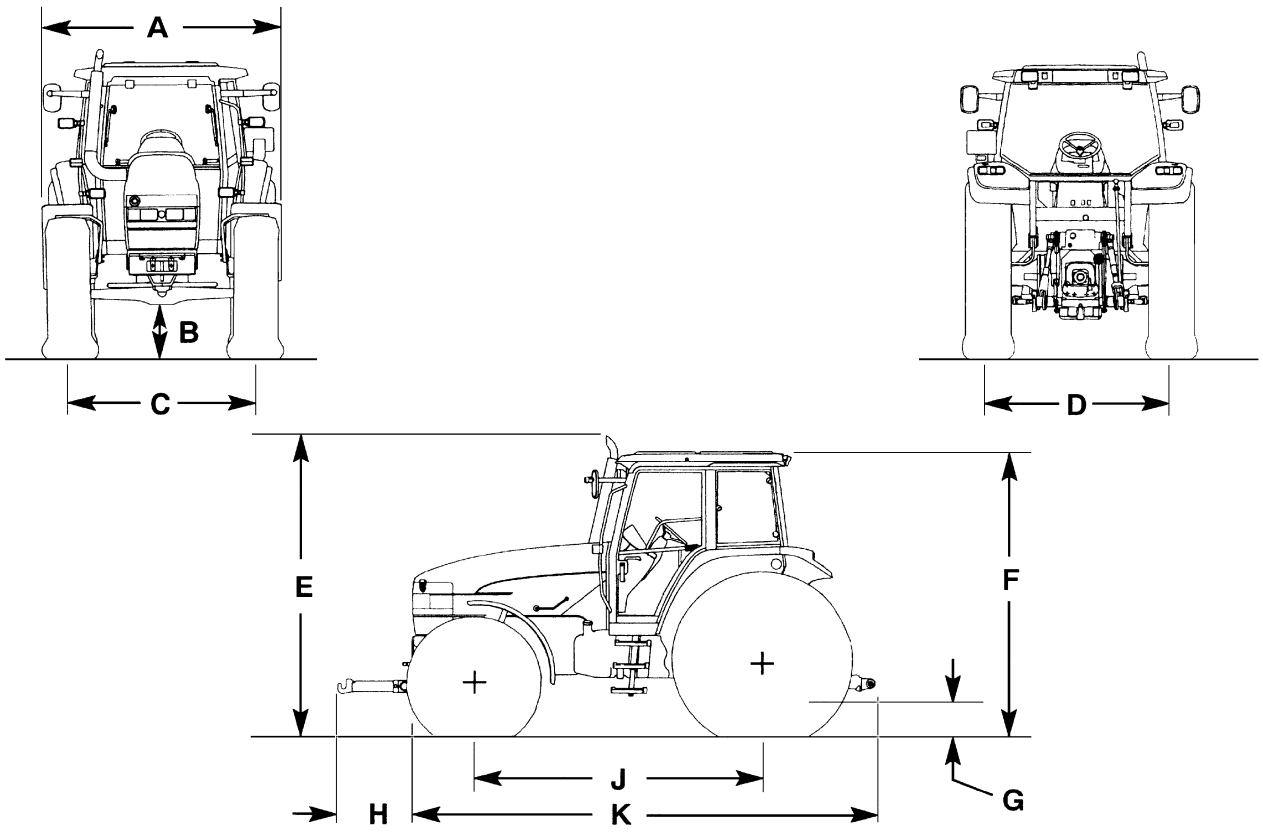
45

IMPORTANT: *When supporting equipment on the drawbar or pick-up hitch ensure that the total weight on the rear axle does not exceed the maximum static downward load or the rear tyre load capacity, whichever is the lower (See* Rear Tyre Pressures and Loads *at the end of Section 3).*

SECTION 8
SPECIFICATION

The specifications on the following pages are given for your information and guidance. For further information concerning the tractor, please consult your authorised dealer.

TRACTOR DIMENSIONS **All Models**



NOTE: *The following dimensions are based on standard tractors fitted with tyre sizes as shown. Allowance must be made for tyres of larger or smaller dimensions:*

	Front tyres (two wheel drive) 11.00 - 16	Front tyres (four wheel drive) 480/70R-28	Rear tyres 580/70R-38
A	Standard fenders	2012 mm	79.2 in
	Extended fenders	2300 mm	90.6 in
B	Under standard 4WD front axle	413 mm	16.2 in
C	2WD	1543 - 2187 mm	60.8 - 86.1 in
	4WD - Manual adjust wheels	1552 - 2269 mm	61.1 - 89.3 in

TRACTOR DIMENSIONS (continued)

	All Models	
D Manual adjust wheels	1530 - 2232 mm	60.2 - 87.9 in
Power adjust wheels	1522 - 2302 mm	59.9 - 90.6 in
98 in. bar axle	1548 - 2554 mm	60.9 - 100.5 in
112 in. bar axle	1548 - 2909 mm	60.9 - 114.5 in
(Depending on wheel equipment fitted, the above dimensions may vary)		
E To top of exhaust	3021 mm	118.9in
F Standard cab	2881 mm	113.4 in
Suspended cab	2991 mm	117.8 in
G Under drawbar	260 mm	10.2 in
H Front hitch projection	285 mm	11.2 in
J 2WD	2747 mm	108.1 in
Standard 4WD axle	2723 mm	107.2 in
Suspended 4WD axle	2783 mm	109.6 in
SuperSteer 4WD axle	2880 mm	113.4 in
K 2WD	4584 mm	180.5 in
Standard 4WD axle	4718 mm	185.7 in
Suspended 4WD axle	4778 mm	188.1 in
SuperSteer 4WD axle	4875 mm	191.9 in
Minimum turning circle (2WD axle at 60 in.front track setting):	3.89 m	12.76 ft.
Minimum turning circle (2WD axle at 72 in.front track setting):	ina	ina.
Minimum turning circle - TM115, TM125, TM135 (Standard 4WD axle at 64 in. front track setting):	3.92 m	12.86 ft.
Minimum turning circle - TM150, TM165 (Standard 4WD axle at 64 in. front track setting):	4.07 m	13.35 ft.
Minimum turning circle (Standard 4WD axle at 72 in. front track setting):	ina	ina.
Minimum turning circle (SuperSteer 4WD axle at 60 in. front track setting):	ina	ina.
Minimum turning circle (SuperSteer 4WD axle at 72 in. front track setting):	ina	ina.

TRACTOR WEIGHT		TM115	TM125	TM135	TM150	TM165
2WD						
On front axle	kg.	1740	1750	1750	1750	1800
	lb.	3835	3858	3858	3858	3968
On rear axle	kg.	2900	2900	3000	3000	3200
	lb.	6393	6393	6613	6613	7054
Total weight	kg.	4640	4650	4750	4750	5000
	lb.	10229	10251	10471	10471	11022
4WD (Standard axle)						
On front axle	kg.	2090	2100	2100	2200	2250
	lb.	4607	4629	4629	4850	4960
On rear axle	kg.	2950	2950	3050	3050	3250
	lb.	6503	6503	6723	6723	7164
Total weight	kg.	5040	5050	5150	5250	5500
	lb.	11111	11133	11353	11574	12125

NOTE: *The above weights are based on the standard build units, without ballast or optional equipment and should be used as a guide only.*

ENGINE		**TM115**	**TM125**	**TM135**	**TM150**	**TM165**
Advertised Engine power (at rated speed)	Kw	78	86	93	104	119
	Hp	105	115	125	140	160
Turbocharged		No	Yes	Yes	Yes	Yes
Rated speed	rev/min.	2200	2200	2200	2200	2300
Maximum no load speed	rev/min. ± 25	2375	2375	2375	2375	2485
Idle speed	rev/min. ± 25	800				
Number of cylinders		6				
Bore	mm.	111.8				
	in.	4.4				
Stroke	mm.	127				
	in.	5.0				
Displacement	cm^3	7472				
	in^3	456				
Compression ratio		17.5:1				
Firing order		1.5.3.6.2.4				
Valve tappet clearance (cold)	mm.	0.36 - 0.46				
Intake	in.	0.014 - 0.018				
Valve tappet clearance (cold)	mm.	0.43 - 0.53				
Exhaust	in.	0.017 - 0.020				

FUEL SYSTEM						
Injection pump type (Rotary)		Bosch VE				
Timing BTDC		3.5°				
Injector crack-off pressure	bar	270 - 278				
	$lbf/in.^2$	3915 - 4031				

COOLING SYSTEM

		TM115	TM125	TM135	TM150	TM165
Type		Pressurised with full flow bypass and recovery tank				
Thermostats		2				
Begins to open at	° C	81				
	° F	178				
Fully open at	° C	95				
	° F	203				
Radiator pressure cap	bar	1.0				
	lbf/in.^{2}	14.5				
Viscous fan - number of blades						
standard		5	5	5	5	5
with front P.T.O./hitch option		5	5	5	5	6
Fan diameter	mm.	508				
	in.	20				

TRANSMISSION

Depending on tractor model, a number of transmission options are available.

Synchro Command transmission

16 x 16 with shuttle	(30 kph - 2/4WD)
32 x 32 with shuttle and creep gears	(30 kph - 2/4WD)
20 x 16 with shuttle	(40 kph - 4WD)
40 x 32 with shuttle and creep gears	(40 kph - 4WD)

Dual Command transmission

23 x 12 with power shuttle	(30 kph - 2/4WD)
46 x 24 with power shuttle and creep gears	(30 kph - 2/4WD)
24 x 12 with power shuttle	(40 kph - 4WD)
48 x 24 with power shuttle and creep gears	(40 kph - 4WD)

Range Command transmission

17 x 6 with power shuttle	(30 kph - 2/4WD)
30 x 12 with power shuttle and creep gears	(30 kph - 2/4WD)
18 x 6 with power shuttle	(40 kph - 4WD)
31 x 12 with power shuttle and creep gears	(40 kph - 4WD)

Power Command transmission

17 x 6 with power shuttle	(30 kph - 2/4WD)
27 x 12 with power shuttle and creep gears	(30 kph - 2/4WD)
18 x 6 with power shuttle	(40 kph - 4WD)
28 x 12 with power shuttle and creep gears	(40 kph - 4WD)

HYDRAULIC SYSTEM		**TM115**	**TM125**	**TM135**	**TM150**	**TM165**
Closed centre system with electronic draft control		std.	std.	std.	std.	std.
Open centre system with mechanical lower link sensing		opt.	opt.	n/a	n/a	n/a
Nominal System Pressure	bar ± 3.0			190		
	lbf/in^2 ± 50			2750		
Flow at Rated Engine Speed	litres/min.	106	106	106	106	116
closed centre system	Imp. gal./min.	23.3	23.3	23.3	23.3	25.5
	U.S. gal./min.	28.0	28.0	28.0	28.0	30.6
Flow at Rated Engine Speed	litres/min.	53	53	n/a	n/a	n/a
open centre system	Imp. gal./min.	11.66	11.66	n/a	n/a	n/a
	U.S. gal./min.	14.0	14.0	n/a	n/a	n/a
THREE-POINT LINKAGE						
Linkage category						
Category II		std.	std	n/a	n/a	n/a
Category II/IIIN		opt.	opt.	std.	std.	std.
Lift capacity						
610 mm. (24 in..) behind link ends	kg.	4425	4425	n/a	n/a	n/a
through full lift range	lb.	9755	9755	n/a	n/a	n/a
less assist ram						
Lift capacity						
610 mm. (24 in..) behind link ends	kg.	5530	5530	5530	5530	5530
through full lift range	lb.	12190	12190	12190	12190	12190
with one assist ram						
Lift capacity						
610 mm. (24 in..) behind link ends	kg.	-	-	6475	6475	6475
through full lift range	lb.	-	-	14275	14275	14275
with two assist rams						
FRONT POWER LIFT						
Linkage category		II	II	II	II	II
Lift capacity through full lift range	kg.			3270		
	lb.			7208		

ELECTRICAL EQUIPMENT

	TM115 TM125 TM135 TM150 TM165
Battery(ies) – standard	1 x 1200 cca (140 A/h)
– optional*	2 x 900 cca (95 A/h)

* Standard in. North America

Alternator – standard	100 amp
– optional	120 amp
Starter Motor	Positive engagement, solenoid operated
– type	3.0 kw – reduction geared

BRAKES

Standard, independent footbrakes	Oil immersed disc acting on differential shafts
Front brakes (optional 4WD)	Oil immersed disc in each hub
Parking brake	3 oil immersed discs acting on bevel pinion shaft

STEERING

Type		Hydrostatic with tilt/telescopic steering wheel
SuperSteer™ 4WD axle		opt.
4WD front axle with suspension		opt.
Front wheel toe-in	mm.	0 – 13
two wheel drive	in.	0 – 0.5
Front wheel toe-in	mm.	0 – 6
four wheel drive	in.	0 – 0.25

MAXIMUM OPERATING ANGLE

Front end up	30°
Rear end up	35°
Right side up	40°
Left side up	40°

FRONT POWER TAKE-OFF		TM115	TM125	TM135	TM150	TM165
Single speed, independent P.T.O. (electro-hydraulic operation)		opt.				
Independent P.T.O. – engine speed at:						
1000 rev/min P.T.O. speed	engine rev/min.	2100				

REAR POWER TAKE-OFF						
2-speed non-shiftable, independent P.T.O. (electro-hydraulic operation)		std. (N. America only)				
2-speed shiftable, independent P.T.O. (electro-hydraulic operation)		std. (except N. America)				
3-speed shiftable, independent P.T.O. (electro-hydraulic operation)		opt. (except N. America)				
Independent P.T.O. – engine speed at:						
540 rev/min P.T.O. speed	engine rev/min.	1970				
540E rev/min P.T.O. speed	engine rev/min.	1546				
1000 rev/min P.T.O. speed	engine rev/min.	2120				
3-speed shiftable, ground speed P.T.O. (electro-hydraulic operation)		opt.	opt. (except North America)	opt.	opt.	n/a
P.T.O. shaft revolutions per wheel revolution with Synchro Command transmission:						
540 rev/min P.T.O.	wheel revs.	13.9	13.9	n/a	n/a	n/a
750 rev/min P.T.O.	wheel revs.	17.6	17.6	n/a	n/a	n/a
1000 rev/min P.T.O.	wheel revs.	23.8	23.8	n/a	n/a	n/a
P.T.O. shaft revolutions per wheel revolution with Dual Command or Range Command transmission:						
540 rev/min P.T.O.	wheel revs.	15.4	15.4	16.0	16.0	n/a
750 rev/min P.T.O.	wheel revs.	19.6	19.6	20.4	20.4	n/a
1000 rev/min P.T.O.	wheel revs.	26.5	26.5	27.6	27.6	n/a

LUBRICANT AND FLUID CAPACITIES		TM115	TM125	TM135	TM150	TM165
Main Fuel Tank	Litres			220		
	Imp. gal.			48.4		
	U.S. gal.			58.0		
Total Fuel Capacity with auxiliary tank	Litres			325		
	Imp. gal.			71.5		
	U.S. gal.			85.8		
Cooling System	Litres	25.5	25.5	25.5	26.0	26.0
	Imp. gal.	5.6	5.6	5.7	5.7	5.7
	U.S. gal.	6.7	6.7	6.7	6.9	6.9
Engine Oil (including filter)	Litres			19.0		
	Imp. pt.			33.4		
	U.S. qts.			20.0		
Four Wheel Drive Front Hubs	Litres	1.7	1.7	1.7	2.15	2.15
(amount shown is for one hub only)	Imp. pt.	3.0	3.0	3.8	3.8	3.8
	U.S. qts.	1.8	1.8	1.8	2.3	2.3
Four Wheel Drive Differential Case	Litres	9.0	9.0	9.0	14.0	14.0
	Imp. pt.	15.8	15.8	15.8	24.6	24.6
	U.S. qts.	9.5	9.5	9.5	14.8	14.8
Transmission/Rear Axle/Hydraulic System						
Synchro Command transmission	Litres	65.0	65.0	n/a	n/a	n/a
and open centre hydraulics	Imp. gal.	14.3	14.3	n/a	n/a	n/a
	U.S. gal.	17.2	17.2	n/a	n/a	n/a

LUBRICANT AND FLUID CAPACITIES (continued)		**TM115**	**TM125**	**TM135**	**TM150**	**TM165**
Transmission/Rear Axle/Hydraulic System						
Dual Command transmission	Litres	73.0	73.0	73.0	n/a	n/a
and CCLS hydraulics	Imp. gal.	16.1	16.1	16.1	n/a	n/a
	U.S. gal.	19.3	19.3	19.3	n/a	n/a
Transmission/Rear Axle/Hydraulic System						
Range Command transmission	Litres	90.0	90.0	90.0	90.0	100.0
and CCLS hydraulics	Imp. gal.	19.8	19.8	19.8	19.8	22.0
	U.S. gal.	23.8	23.8	23.8	23.8	26.4
Transmission/Rear Axle/Hydraulic System						
Power Command transmission	Litres	n/a	n/a	n/a	90.0	100.0
and CCLS hydraulics	Imp. gal.	n/a	n/a	n/a	19.8	22.0
	U.S. gal.	n/a	n/a	n/a	23.8	26.4

Rear Axle/Hydraulics Oil Level when using Remote Hydraulic Equipment

When checking the rear axle oil level, it is good practice to ensure that the oil is up to the full mark on the dipstick with the tractor parked on level ground. However, when connecting auxiliary equipment to the remote control valves it should be remembered that the equipment utilises oil from the rear axle and could seriously lower the oil level. Operating the tractor with a low oil level may result in. damage to the rear axle and transmission components.

With the rear axle oil level up to the full mark on the dipstick, the following **maximum** oil volumes may be taken from the rear axle to power auxiliary equipment without the need to further top up the system:

Operating stationary equipment on level ground: 35 litres (61.6 Imp. pt.) (37 U.S. qts.)

Operating while driving in. normal conditions (flat fields) for short periods only: 20 litres (35.2 Imp. pt.) (21.1 U.S. qts.)

Operating in. other conditions, including longer periods of use: 10 litres (17.6 Imp. pt.) (10.6 U.S. qts.)

Conversely, the maximum amount of oil that may be added to the rear axle above the normal FULL level is 4 litres (7 Imp. pt.) (4.2 U.S. qts.). With this quantity added to the rear axle, the quantities stated above may be increased by the same amount, 4 litres (7 Imp. pt.) (4.2 U.S. qts.), but no more.

LUBRICANT AND FLUID SPECIFICATIONS All models

New Holland Brand Name	New Holland Specification	International Specification
Transmission/rear axle/hydraulics, hydrostatic steering, front axle casing and hubs (4WD):		
Ambra Multi G	NH 410 B	API GL4, ISO 32/46 (SAE 10W30)
Brake/clutch reservoir:		
Ambra Brake LHM	NH 610 A	-
Lubrication fittings:		
Ambra GR75MD	NH 720 A	NLGI 2
Cooling system:		
Ambra Agriflu	NH 900 A	-

NOTE: *Use antifreeze (50%) plus clean, soft water (50%). In order to reduce deposits and corrosion, water used in. the cooling system should not exceed the following limits:*

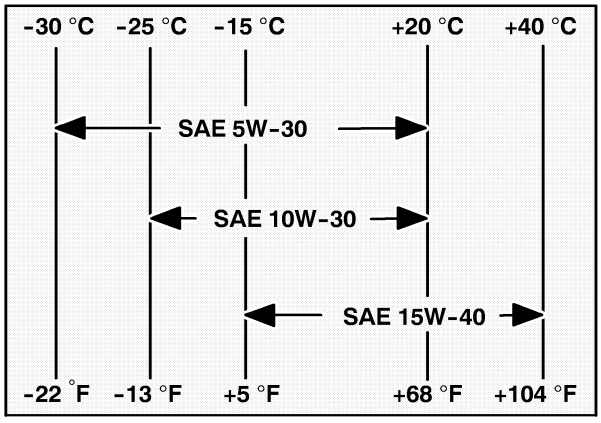
Total hardness:	Chlorides	Sulphates
300 parts per million	*100 parts per million*	*100 parts per million*

IMPORTANT: *See Section 4 regarding use of coolant inhibitor where above-mentioned antifreeze is not available. In those hot countries where antifreeze is not available, use* ***clean*** *water only.*

Engine:		
Ambra Super Gold - 15W40	NH 330 G	API CF-4/SG, CCMC D4, MIL-L-2104E
Ambra Super Gold - 10W30	NH 324 G	API CF-4/SG, CCMC D4, MIL-L-2104E

Engine Oil

The correct engine oil viscosity grade is dependent upon ambient temperature. Refer to the chart on the right when selecting oil for your tractor engine.



NOTE: *In areas where prolonged periods of extreme temperatures are encountered, local lubricant practices are acceptable; such as the use of SAE 5W30 in. extreme low temperatures or SAE 50 in. extreme high temperatures.*

Sulphur in. Fuel

The engine oil change period is shown in section 4. However, locally available fuel may have a high sulphur content, in which case the engine oil change period should be adjusted as follows:-

Sulphur Content %	*Oil Change Period*
Below 0.5	*Normal*
0.5 - 1.0	*Half the normal*
above 1.0	*One quarter normal.*

The use of fuel with a sulphur content above 1.3% is not recommended.